

A PRACTICAL GUIDE TO MAINTENANCE AND REPAIR
COVERING MODELS FROM 1946

HUMBER CARS

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M.I.M.I.



MOTOR CAR MAINTENANCE
AND REPAIR SERIES

PREFACE

THIS book deals with the Humber cars produced during the post-war years—1946 up to the present day—and is intended to assist the owner-driver in the maintenance of his car, and to cater for those interested in carrying out repairs and adjustments. At the same time it provides information invaluable to the garage mechanic.

The models covered include Hawk Mk. I to VI, New Hawk Series I, Ia and II, Snipe Mk. I, Super Snipe Mk. I to IV, New Super Snipe Series I, II and III, and Pullman and Imperial Mk. I to IV.

It will, of course, be realised that major overhaul requires special tools and setting gauges, apart from detailed knowledge of the particular component, and such work is therefore best left to the Rootes Dealer who also has trained personnel for the purpose. The various components are nevertheless described in some detail for the owner who is interested in the construction and method of adjusting such major components as the engine, gearbox and rear axle.

The author and publishers wish to thank Rootes Ltd. for their assistance in providing information and illustrations, and also for permission to use the Humber Trade Mark as a cover design, although the book is in no way a factory sponsored production.

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CHAPTER I

SURVEY OF MODELS

THIS chapter serves as an introduction to the various models produced since 1946, and gives a brief tabulated specification of each model with its chassis number series and provides illustrations of all the models listed.

General Classification of Models

Hawk Mk. I (1946-47).—Chassis No. 2700001 onwards. 4-cylinder 1,944-c.c. side-valve engine. Floor gear change. I.F.S. by transverse leaf spring and wishbones.

Hawk Mk. II (1948).—Chassis No. 5800001 onwards. Similar to Mk. I, but with steering-column gear change and baulking ring-type synchromesh gearbox.

Hawk Mk. III (1949-50).—Chassis No. 5900001 onwards. New full-width body styling, coil spring and wishbone I.F.S., two-leading shoe front brakes.

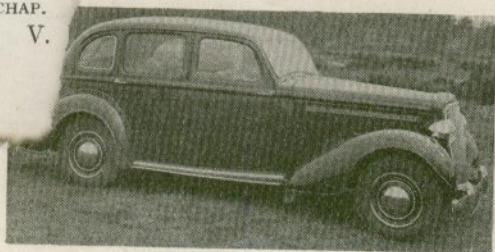
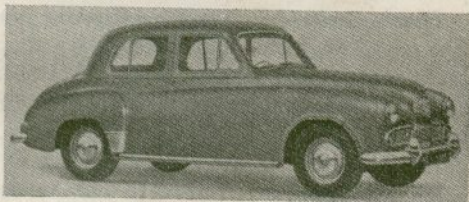
Hawk Mk. IV (1950-51).—Chassis No. A5000001 onwards. Similar to Mk. III, but with engine enlarged to 2,267-c.c. capacity, with duralumin connecting rods. Separate side lamps.

Hawk Mk. V (1952-3).—Chassis No. A5200001 onwards. Improved frontal treatment. Plated kick pads to rear wings.

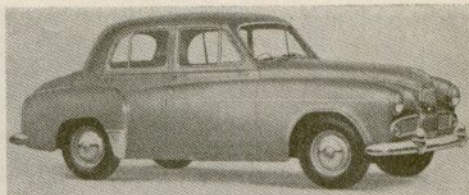
Hawk Mk. VI (1954-7).—Chassis No. A5400001 onwards. New O.H.V. engine of same capacity. Rear wings restyled and more prominent. Wider brakes. Overdrive offered as optional extra.

Hawk Series I (1957-9).—Chassis No. A5700001 onwards. Entirely new, lower and wider body shape, employing integral body/chassis construction. Larger front brakes, divided propeller shaft with centre bearing. Borg Warner automatic transmission available.

Hawk Series Ia (1959-60).—Chassis No. B5000001 onwards. Similar to Series I, but with closely spaced waist line body mouldings.

CHAP.
V.*(Left)* HAWK Mk. I
AND II (1946-48)*(Right)* HAWK Mk.
III (1949-50)*(Left)* HAWK Mk.
IV (1950-51)*(Right)* HAWK Mk. V
(1952-53)

(Right) HAWK Mk.
VI (1954-57)



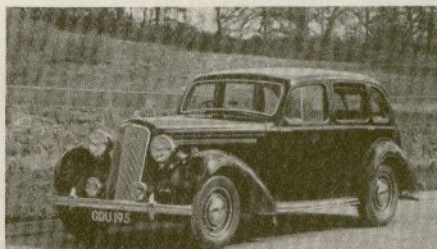
(Left) Hawk SERIES
I (1957-59)

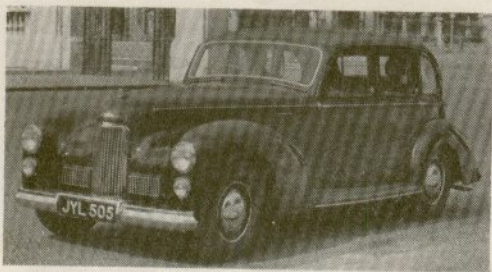


(Right) HAWK
SERIES IA (1959-60)



(Left) SNIPE Mk.
I AND SUPER SNIPE
Mk. I (1946-47)





(Left) SUPER SNIPE
Mk. II (1948-49)

(Right) SUPER
SNIPE AND TOURING
LIMOUSINE Mk. III
(1950-52)



(Left) PULLMAN
Mk. I (1946-47)

(Right) PULLMAN
LIMOUSINE AND
IMPERIAL Mk. III
(1951-53)

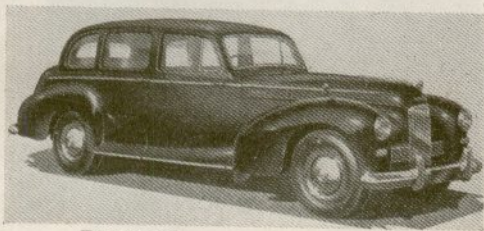


PLATE III

(Right) SUPER
SNIPE Mk. IV
(1952-56)



(Left) Super SNIPE
SERIES I (1958-59)



(Right) SUPER
SNIPE SERIES II
(1959-60)



SUPER SNIPE SERIES III (1960-

Hawk Series II (1960-61).—Similar in appearance to Series Ia, but with vacuum servo Girling disc brakes at front (identical with Super Snipe Series II and III). Suspension as Super Snipe Series III, also improved throttle control. Ammeter, oil-pressure gauge, windscreen washer and heater all now standard and for home market. Other aspects of car continue unchanged, except that Borg Warner automatic transmission is no longer available.

Snipe and Super Snipe Mk. I (1946-47).—Chassis No. 4700001 onwards (Snipe); 8700001 onwards (Super Snipe). Six-cylinder side-valve 18- and 27-h.p. engines respectively. Both models identical in appearance apart from name badge on upper front bonnet sides. Floor gear change. I.F.S. by transverse leaf spring and wishbones.

Super Snipe Mk. II (1948-49).—Chassis No. 8800001 onwards. Engine similar to Mk. I 27-h.p. Wider body with swept wings and built-in headlamps. Steering-column gear change. Two-leading shoe front brakes. Suspension as Mk. I.

Super Snipe Mk. III (1950-52).—Chassis No. A8000001 onwards. Similar to Mk. I but with separate step mats for front and rear entry on running boards. Five-inch wide front spring introduced.

Pullman Mk. I (1946-47).—Chassis No. 6710001 onwards. A long chassis version of the Super Snipe Mk. I, with limousine or specialised coachwork.

Pullman and Imperial Mk. II, III and IV (1948-53).—Chassis No. 9800001 onwards (Mk. II); A9000001 onwards (Mk. III); A9200001 onwards (Mk. IV). More spacious and modern-style coachwork with swept wings and built-in headlamps. All three models similar in appearance. Later Mk. II cars had 5-in. wide front spring. Mk. IV cars fitted with O.H.V. engine. Imperial saloon has no division and leather rear upholstery. All Pullmans had divided propeller shaft.

Super Snipe Mk. IV (1952-56).—Chassis No. A8200001 onwards; A8400001 onwards; A8410001 onwards. New full-width body styling. I.F.S. by coil springs and wishbones. O.H.V. engine of 4.1-litre capacity. Later cars (from chassis No. A8400001) had walnut veneer fascia panel. From chassis No. A8410001, overdrive or automatic transmission optional. Rear

axle ratio of 3.7 or 3.9: 1 on "82" chassis numbers indicated by suffix /7 or /9 (see Rear Axle chapter).

Super Snipe Series I (1958-59).—Chassis No. A8900001 onwards. Entirely new lower and wider body styling with integral construction. New 2.6-litre O.H.V. 6-cylinder engine with hemispherical combustion chambers. Servo-assisted Girling brakes. Divided propeller shaft.

Super Snipe Series II (1959-60).—Chassis No. B8000001 onwards. Similar to Series I, but of improved appearance with the addition of closely spaced body waist-line mouldings, and radiator grille with fewer bars. Disc brakes on front wheels. Engine enlarged to 3-litre capacity. Overdrive, automatic transmission and power-assisted steering optional on Series I and II cars.

Super Snipe Series III (1960-61).—Improved suspension system, including higher rated coils and smaller diameter anti-roll bar at front, and wider spring leaves at rear, reduced in number from 5 to 4.

Detail modifications to the 3-litre engine, including increased capacity bearings, modified lubrication system. The front and two centre main bearings are lead-indium. Diameter of main oil gallery enlarged, and crankshaft modified to increase oil flow to bearings. New distributor drive gears. Distributor unit repositioned at front of engine for easier servicing. Improved throttle control. Paper-element air cleaner now fitted.

Modifications to cooling system include new water pump and replacement of the 8-blade fan by a larger diameter 4-blade fan. Additional pulley wheel in front of that for fan provided to drive pump for power steering, available as an optional extra.

Gearbox top and 2nd gears: new baulk rings and modifications to chamfering to improve synchro-mech efficiency. Borg Warner intermediate hold control is now on the selector lever.

Twin headlamps each side introduced.

HAWK MODELS

Side-valve Engine—Mk. I to V (1946-53)

Four-cylinder, 4-stroke side-valve engine, with adjustable

tappets and detachable valve guides. Valve springs and cups secured by split cotters. Access to tappets for adjustment by removal of tappet side cover, plus removal of cylinder head for dismantling. Pistons and connecting rods on Mk. I, II and III (75-mm. bore) engines removable from below after removal of sump. On Mk. IV and V (81-mm. bore) engines, cylinder head must also be removed and pistons withdrawn upwards.

Oil pump and distributor driven by skew gears from centre of camshaft. Access to pump after removal of sump. Distributor driven via offset-shaft drive and mounted on cylinder head.

Crankshaft, of forged steel with three main bearings, has end float controlled by thrust washers flanking rear main bearing. Main and big-end bearings are of the replaceable thin-wall type.

A renewable oil seal is fitted in the front timing cover, operating on the hub of the crankshaft pulley. It is assisted by an oil catcher located between the pulley and the crankshaft timing wheel. A helix machined behind the crankshaft rear main-bearing journal works in a closely machined bore at the rear of the main-bearing housing.

The camshaft is driven by double-roller chain, end float being controlled by a location plate at the front end. A spring-blade chain tensioner is fitted.

On Mk. I, II and III engines, the camshaft timing wheel is a press fit on the end of the camshaft, which must be removed if either component requires renewal. On all later engines the camshaft wheel is detachable, after removal of a nut and locking washer.

Cooling is assisted by a water pump, belt driven in conjunction with the dynamo, off the crankshaft.

O.H.V. Engine—Hawk Mk. VI to Series II (1954 Onwards)

With the exception of the cylinder head and valve gear, the later Hawk engines are closely related to the side-valve types. Push-rod operated, in-line overhead valves are employed, with a separate port for each valve.

The distributor is mounted on the cylinder head on Mk. VI

engines, but on Series I onwards, due to the lower bonnet line, the distributor is moved to a mounting on the front timing cover, which is of aluminium alloy. A different water pump giving a lower fan centre is also used on Series I onwards.

Gearbox and Clutch—Hawk Models

Four-speed gearboxes are fitted to all models, with synchromesh on the upper three ratios. Mk. I cars have the early friction cone-type of synchronisation, in which the sliding member has to overcome the pressure of spring-loaded balls in the hub holding the cone against the gear to be selected, before actual engagement.

On Mk. II and all later models, synchronisation is achieved by rings and shifting plates, the former blocking the path of the sliding member until synchronisation is effected, giving the advantage of a lighter and more efficient action, which is desirable with steering-column gear change.

Overdrive was provided as an optional extra from Mk. VI onwards. Selected electrically by means of a switch and solenoid, a cone clutch is hydraulically engaged to hold still the sun wheel of a planetary gear set. This causes the planet carrier to be driven by an extension of the gearbox mainshaft around the stationary sunwheel, in turn driving the third member, or annulus at a speed greater than the gearbox mainshaft. This steps up the final drive ratio from 4.55 to 3.54:1. When the switch is moved to direct drive, all members rotate at the same speed.

Borg Warner fully automatic transmission was made available for Series I and Ia cars. Briefly this consists of a 2-speed and reverse planetary gearbox, operating in conjunction with a torque converter which also contains a direct-drive clutch, giving three forward speeds in all. Changes are carried out automatically through the medium of a governor and a hydraulic system, to suit the road speed and load conditions. A steering-column mounted lever with stations, P, N, D, L and R allows the driver to select Park, Neutral, Drive (fully automatic), Low (held) and Reverse.

On later Series I and all Series Ia an intermediate gear "hold" control is fitted to the automatic transmission (see page 23).

Rear Axle—Hawk Models

Mk. I and II cars have spiral-bevel final drive. All subsequent models use hypoid-bevel drive, with the pinion shaft set below the crownwheel centre line, to permit a lowering of the floor level. Rear hubs are semi-floating on all models, and open propeller shafts are used throughout.

The differential is removable from the axle casing after drawing the half shafts. On Mk. I and II models, side adjustment of the crownwheel is by screwed sleeves, and the pinion housing is detachable and is adjusted in or out by selection of shims.

On cars from Mk. III onwards (hypoid axles) all adjustment is by shims, and the pinion is housed in the differential casing. Jigs are recommended for setting up these axles.

Front Springs—Hawk Models

Mk. I and II cars had independent front suspension utilising a low-mounted transverse leaf spring connected to the lower end of each stub axle. Short wishbones, located between the upper stub-axle pivots and the chassis frame, completed the linkage. Front springs were fitted with a safety strap below the main (lowest) leaf. Wheel camber is adjustable by turning the eccentric outer fulcrum pin of each wishbone.

All models from Mk. III onwards have coil spring and wishbone-type front suspension. Wheel camber is adjustable by selection of shims placed between the inner fulcrum pin of each upper wishbone and its mounting on the crossmember.

Rear Springs—Hawk Models

Semi-elliptic leaf springs are used throughout, pivoted at the front end and shackled at the rear, using Silentbloc bushes which need no lubrication. Springs are not interchangeable between the various models.

Brakes—Hawk Models up to Series Ia

Lockheed hydraulic brakes are used on all Hawk models up to Series Ia and are of the leading and trailing shoe type on Mk. I and II. In this system a single wheel cylinder expands each pair

of shoes from one end only, the other ends pivoting on a fixed axis.

Mk. III models onwards employ two-leading shoes on the front brakes and leading and trailing shoes at the rear. With the two-leading shoes system a separate wheel cylinder operates each brake shoe, the other end of the shoe abutting the fixed end of the cylinder body. In this manner theoretically equal leverage is applied to each shoe, providing even lining wear and resulting in a more efficient brake unit.

The handbrake linkage differs between Mk. I and II and later models, the former employing what was known as a bisector-type expander in each rear-wheel cylinder. In this system a tapered block expanded the shoes through the medium of rollers and plungers when pulled inwards by the rod-operated handbrake linkage.

Later models with two-leading shoe brakes employ a lever, pivoting in each rear-wheel cylinder to move the hydraulic piston of that cylinder through the medium of a mechanical piston, when the handbrake is applied. Each rear-wheel cylinder is allowed to slide in the brake back plate, and the shoes are expanded by movement of the piston and reaction of the cylinder on the secondary shoe.

Brakes—Hawk Series II

Girling servo-assisted hydraulic braking system is used on Hawk Series II models, with disc front brakes and leading and trailing-shoe drum rear brakes.

Steering Gear—Hawk Models

In all models a steering gear of the Burman type is used, although the mechanism of the units and the actual steering linkage differ considerably between Mk. I and II and later models.

Worm and nut steering is employed on Mk. I and II cars, in which a multi-start nut engages a worm at the lower end of the inner column. Axial movement of the nut is transferred to lateral movement at the drop arm by a rocker shaft and ball peg. Provision is made for end-float adjustment of the rocker shaft by a screw and locknut in the steering-box cover, and for inner

column end-float adjustment by locknuts at the upper end of the inner column. Twin track rods of unequal length connect the drop arm to the steering arm on each stub axle.

A more refined type of steering unit, known as a recirculating ball type, is employed on Mk. III and all later models, in which the worm causes the nut to move through the medium of a number of spherical balls interposed between the male and female threads. A special half nut is employed, running in a guide in the steering box, movement taking place through the balls in the upper half of the nut, the lower half of which being in the form of a transfer tube to permit circulation of the balls. Adjustments are again provided for rocker-shaft and inner-column end float, the latter by selection of shims beneath the base plate at the lower end of the column.

An improved type of steering geometry is designed into these models, which have a centre track rod joining the drop arm to the slave arm, or idler lever, situated on the opposite side of the chassis to the drop arm. Two track rods of equal length connect these arms to the steering arms and stub axles.

Electrical System—Hawk Models

A 12-volt lighting, starting and charging circuit is used on all models, with automatic voltage control. A 35 amp fuse is placed in the auxiliaries circuit, between A1 and A2, serving the horns and dipper direct, and another fuse, between A3 and A4, through the ignition switch, serves trafficators, heater, stop lamps, etc.

SNIPE, SUPER SNIPE, PULLMAN AND IMPERIAL MODELS

Side-valve Engines—Snipe Mk. I, Super Snipe, Pullman and Imperial Mk. I to III

Six-cylinder, 4-stroke side-valve engine with adjustable tappets and detachable valve guides. Access to valves similar to Hawk side-valve engine. Cylinder head of aluminium alloy. On Snipe (18 h.p.) engines pistons are removable with connecting rods after removal of sump. On other engines (27 h.p.) cylinder head must be removed and pistons and rods drawn upwards.

External oil pump and distributor driven in tandem, by shafts set at an angle across crankcase, from skew gears at centre of camshaft. Offset drive to distributor shaft; oil pump renewal disturbs timing.

Crankshaft of forged steel with detachable balance weights, carried in four main bearings, has end float controlled by split washers on either side of rear bearing, located by dowels in cap. Main bearings of replaceable thin-wall type. Big-end bearings on all but early engines are of replaceable thin-wall type; early connecting rods have white metal run direct into rods, although rods are interchangeable in sets.

A renewable composition oil seal is fitted in the front timing cover, the seal being changed by removal of rivets from the housing and re-rivetting. Note joint washers between timing cover, housing and inner ring. A helix machined behind the crankshaft rear main-bearing journal works in a closely machined bore at the rear of the main-bearing housing.

The camshaft is driven by double-roller chain with spring tensioner, end float being controlled by a thrust plate at the front end. Sprockets detachable together for renewal of chain.

Cooling is by water pump and fan driven from the crankshaft by belt, in conjunction with the dynamo.

O.H.V. Engine—Super Snipe and Pullman Mk. IV

Six-cylinder, 4-stroke overhead-valve engine of conventional design, with adjustable rockers operated by pushrods. Cast-iron cylinder head with separate ports for all valves. Early engines, up to No. A8201685, have low-compression head (6.48:1): all later engines being 7.13:1, identified by letters H.C. on side of cylinder head, either above manifold or between No. 3 and 4 sparking plugs.

Pistons and connecting rods removable upwards through tops of cylinder bores after removal of cylinder head and sump. Big-ends split diagonally and caps secured by bolts and locking tabs; caps are dowelled.

Distributor and submerged-type oil sump are driven by skew gears from centre of camshaft, the distributor having an offset drive to facilitate replacement. Oil pump is removable, after

detaching sump and floating intake filter, by removal of a dowel screw and locknut situated on the outside of the crankcase immediately below the distributor.

The crankshaft, of forged steel with integral balance weights, is carried in seven main bearings, and has end float controlled by thrust washers flanking the rear main bearing and keyed into the cap. Main and big-end bearings are of the thin-wall type.

A lip-type oil seal is pressed into the timing cover and operates on the hub of the crankshaft pulley. An oil thrower is fitted immediately inside the cover. At the rear end a helix is machined immediately behind the rear main-bearing journal of the crankshaft and runs in a closely machined bore at the back of the bearing housing.

The camshaft is driven by double-roller chain with spring tensioner and steady incorporated in the tensioner body. End thrust is taken by a flange plate immediately behind the timing wheel, bolted to the cylinder block. Sprockets, chain and tensioner are removable together. Cooling is by water pump and fan with conventional triangulated drive.

O.H.V. Engine—Super Snipe Series I to III

Six-cylinder engine with inclined overhead valves and hemispherical combustion chambers. Water-jacketed inlet manifold. Compression ratio 7·5 or 8·0: 1. Engine capacity: Series I, 2·6-litres; Series II and III, 3-litres.

Gearbox and Clutch—Snipe, Super Snipe and Pullman

Snipe, Super Snipe and Pullman Mk. I models have a 4-speed gearbox with central floor change, having ball- and spring-type synchromesh on 3rd and top gears only, and incorporating a centre bearing for the mainshaft.

Super Snipe and Pullman Mk. II to IV have 4-speed gearbox with steering-column change, with synchromesh on all forward ratios. This gearbox is of the later type with baulking rings and shifting plates to afford more positive synchronisation, with less manual effort on the gear lever. No centre bearing is fitted.

On later Super Snipe Mk. IV cars an overdrive was available as an optional extra, and was almost identical to the unit fitted to

Hawk Cars, although 12 instead of 8 clutch springs were used in the overdrive. Overdrive operates on top gear only.

A 3-speed and reverse gearbox is used on the New Super Snipe Series I, II and III, having synchromesh of the baulking-type on all forward ratios. An overdrive unit is optional, operating on 2nd and top gears, and assists acceleration and high-speed cruising. A refinement in control is obtained by the inclusion of a throttle switch in the overdrive control circuit. This prevents the change back from overdrive into direct drive with a closed throttle and, by delaying the change until the throttle is opened ensures a smooth change back into direct drive.

Borg Warner automatic transmission, which was first introduced into the Humber range with later Mk. IV Super Snipe, is also available as an alternative to the conventional gearbox or overdrive on Series I, II and III. The principles of operation were described in the section referring to the Hawk. Its installation is similar for all models, although on Super Snipe Series I, II and III and later Hawk Series I and all Hawk Series Ia, an intermediate gear "hold" control is fitted. This control enables the driver to select at will the speeds at which the car will change out of this ratio into direct drive and vice versa, up to speeds of approximately 55 m.p.h. in intermediate. This refinement is useful in hilly country or on winding roads when, if an obstruction is met at a speed of, for instance, 30 m.p.h. in intermediate, lifting of the accelerator would promote an unwanted change up into top gear, to be rapidly followed by a reversion to intermediate as soon as the throttle is again depressed, resulting in some discomfort for passengers. With the "hold" control in operation this is avoided, although fully automatic changes may be reintroduced by pushing the control right home.

All models with conventional transmission employ a Borg and Beck single dry-plate clutch and, with the exception of the latest Super Snipes which use hydraulic-withdrawal mechanism, are disengaged by adjustable mechanical linkages.

Rear Axle—Snipe, Super Snipe and Pullman

Snipe and Super Snipe Mk. I, Super Snipe Mk. II and III and all Pullman models are fitted with a semi-floating type rear

axle with spiral-bevel final drive. Heavy-duty versions of the Super Snipe Mk. IV, mainly allocated to export territories, were also thus equipped.

Standard Super Snipe Mk. IV cars were fitted with three-quarter floating axles with hypoid-bevel final drive.

The new Series I and II cars also use an hypoid axle although the rear-hub mounting is semi-floating.

The differential units are removable from all types after withdrawing the axle shafts. Spiral-bevel axles have screwed adjustment for crownwheel side adjustment and detachable pinion-shaft housings. Hypoid axles have shim adjustment throughout and integral-pinion housings.

Front Springs—Snipe, Super Snipe and Pullman

Mk. I to III Snipe, Super Snipe and all Pullman and Imperial models have I.F.S. with transverse leaf spring and triangular upper links. Wheel camber is adjustable by turning the eccentric outer fulcrum pin of each upper link. Super Snipe from Mk. III and all Pullman and Imperial cars from late Mk. II had 5 in.-wide front springs. Lever arm dampers (shock absorbers) are used.

Mk. IV and later models have coil spring and wishbone front suspension with telescopic dampers.

Rear Springs—Snipe, Super Snipe and Pullman

Semi-elliptic springs with Silentbloc-type bushes are used throughout, with telescopic dampers from Super Snipe Mk. IV onwards.

Brakes—Snipe, Super Snipe and Pullman

Mk. I models have Lockheed leading and trailing-shoe brakes.

Mk. II to IV are fitted with Lockheed two-leading shoe front and leading and trailing shoe rear brakes.

Series I cars employ Girling two-trailing shoe front, leading and trailing shoe rear, servo assisted.

Series II and III have Girling disc at front, and leading and trailing shoe drum brakes at rear, servo assisted.

Steering Gear—Snipe, Super Snipe and Pullman

All Mk. I cars have worm-and nut-type steering gear, although of similar design to that used on the lighter Hawk Models, is more robust. From Mk. II cars up to the present day, recirculating ball-type steering is employed, of similar design to that already described for Hawk models.

Power-assisted steering became available as an optional extra from the new Series I cars onwards and a brief description of this system is outlined below.

A hydraulic reservoir filled with low-viscosity engine oil feeds a pump, belt driven off the engine, serving a hydraulic ram, fixed to the chassis at one end and to the steering drop arm at the other. Ball joints fixed at each end of the movable part of the ram are connected to the steering arms by means of the two track rods. A power valve is incorporated with the steering drop-arm ball joint, also connected to the movable part of the ram. Movement of the steering wheel, and therefore the drop arm, in either direction causes the valve to move and open one side of the ram, or the other, to hydraulic pressure, thus imparting power assistance in the direction required. Power assistance stops as soon as steering wheel effort is relaxed.

Electrical System—Snipe, Super Snipe and Pullman

A 12-volt electrical system, with compensated-voltage control charging circuit is used on all models. Latest models have an improved regulator with an additional coil which permits a higher dynamo output to suit the demands of modern lamps, accessories, etc.

Flashing direction indicators and two-speed screen wipers were introduced with Mk. IV models.

CHAPTER II

PERIODICAL ATTENTION

THIS chapter describes the lubrication of the engine, gearbox and rear axle, and covers chassis lubrication and general maintenance. The lubrication and maintenance table given at the end of the chapter indicates the work recommended at given mileage intervals.

ROUTINE LUBRICATION

Engine

The oil circulation is by a gear-type pump on all Hawk models, and on all 6-cylinder engines up to those used on the Super Snipe Series I. Later 6-cylinder engines are fitted with an Hobourn Eaton vane-type pump. The oil pump draws oil through a suction filter gauze and delivers to the main oil gallery and a by-pass filter on 4-cylinder side valve and O.H.V. engines and 6-cylinder side-valve engines. A full-flow filter, through which all the oil circulates, is used on 6-cylinder overhead-valve engines. The oil should be changed every 2,000 miles.

Filter elements of both types of filters should be renewed every 6,000 miles, when the container should be drained or wiped clean.

An internal relief valve is incorporated in the body of full-flow filters so that there will be oil circulated even if the filter element is completely choked; the oil, however, will not be filtered in this event.

Many modern oils contain additives and, having some detergent or cleansing properties, tend to become discoloured very soon after being put into use. Whilst, therefore, they may appear to have become discoloured early in their life, it should not be assumed that they are necessarily fouled. On the other hand, the owner should carefully check the oil condition, and if there are

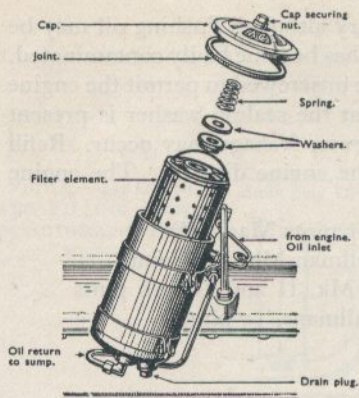


FIG. 1.—BY-PASS OIL FILTER.

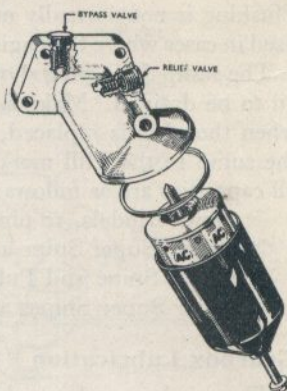


FIG. 2.—FULL-FLOW OIL FILTER.

signs of heavy contamination, the oil and filter element should be changed.

On new and reconditioned engines, the oil should be used only for the first 500 miles, when it should be drained, and the sump refilled with clean oil. This will then be suitable for a further 2,000 miles.

By-pass Filter.—Undo the central fixing bolt in the lid of the container and pull out the old element. Clean the container inside, insert the new element and washers, if fitted, and replace the cap, using the new joint supplied with the kit. Replace the fixing bolt with a new washer and tighten. Run the engine and check for leaks.

Full-flow Filter.—Proceed as with the by-pass filter, but pay careful attention to the sealing ring when refitting the container, as this type of filter is subjected to the full oil pressure of the engine. After removing all traces of the original ring, the new ring should be carefully positioned, locating it first at four diametrically opposite points; then work it evenly into position. Run the engine and check for leaks.

Draining Engine Oil.—Drain the engine oil, if possible, after a run, since the oil will then be hot and flow more freely, bringing with it at the same time any dirt which may be in suspension.

Flushing is not normally necessary although flushing oil may be used in cases where the engine oil has become badly contaminated.

The sump drain plug should be unscrewed to permit the engine oil to be drained. Make sure that the sealing washer is present when the plug is replaced, otherwise leakage may occur. Refill the sump to the Full mark on the engine dipstick. The engine oil capacities are as follows:

Hawk Models, 10 pints ($10\frac{1}{2}$ pints Mark VI)

Snipe, Super Snipe and Pullman Mk. I, 14 pints

Super Snipe and Pullman Mk. II and III, 16 pints

Later Super Snipes and Pullmans, 15 pints

Gearbox Lubrication

The gearbox and overdrive (if fitted) should be drained and refilled with fresh oil after the first 500 miles and thereafter every 6,000 miles, the drain plug being located in the base of the casing.

On automatic transmission models this unit and the torque converter should be drained and refilled only every 25,000 miles. Drain plugs are located in the sump of the transmission unit and in the torque converter casing, accessible when in line with the lower bellhousing aperture. The oil level is indicated by dipstick reading with access after removal of a cover in the floor tunnel. The dipstick orifice is also the filler. Check oil level every 3,000 miles.

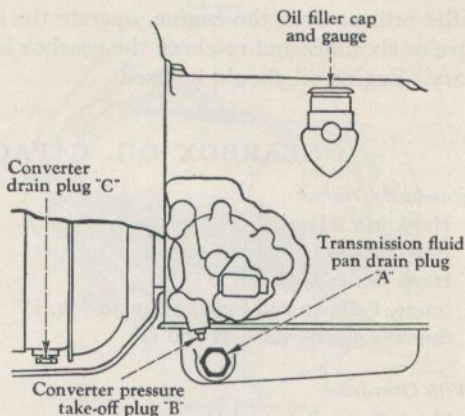
Draining and refilling, and checking the oil level in the automatic transmission is worthy of special note as follows:

Checking Fluid Level—Automatic Transmission.—This should be done every 3,000 miles at normal operating temperature with the engine idling. Remove the inspection cover in the car floor and wipe the area around the filler cap before removing the dipstick.

With the engine still idling, place the selector lever in the L (low) position and take a dipstick reading. Add automatic transmission fluid to bring the level to the full mark. Recheck the level. Do not overfill.

Draining and Refilling—Automatic Transmission.—Drain and refill every 25,000 miles, with the unit at normal operating temperature. With the engine stopped remove drain plug (A, Fig.

FIG. 3.—DRAINING
AND FILLING POINTS
ON AUTOMATIC TRANS-
MISSION.



3) at the left side of the transmission and drain transmission. Rotate the converter until the drain plug (C, Fig. 3) appears at the lower opening of the converter housing and remove the converter drain plug. With converter drain plug removed take out the converter pressure take-off plug (B, Fig. 3), this plug being located at the bottom of the reverse servo cylinder. After the fluid has been drained refit the converter drain plug. Fit the oil-pan drain plug and the converter pressure take-off plug. Remove the transmission filler cover from the floor, clean the area around the filler cap, and remove the cap and dipstick. Pour 10 pints of automatic transmission fluid into the transmission through the filler opening. Start the engine and allow it to idle for one minute with the selector lever in the "L" position to transfer the fluid to the converter from the transmission case. With the engine still idling and the selector lever in the "L" position, add enough fluid to bring the level up to the full mark on the dipstick. Approximately 15 pints are required to refill the transmission and converter after draining. Do not overfill. Refit inspection cover and mats.

Overdrive Lubrication.—Check the level every 1,000 miles by inspecting the gearbox level, as oil is fed from the gearbox to maintain the overdrive level. Every 6,000 miles drain the gearbox and overdrive (two separate plugs) and refill through the gearbox

filler orifice. Run the engine, operate the overdrive unit control five or six times and re-check the gearbox level. Top up if necessary. Engine oil should be used.

GEARBOX OIL CAPACITIES

Standard Gearbox

	<i>Pints</i>
Hawk Mk. III to V	1 $\frac{3}{4}$
Hawk Mk. VI	2 $\frac{1}{4}$
Hawk Series I, Ia and II	2 $\frac{3}{4}$
Snipe, Pullman and Super Snipe to Mk. IV	5
Super Snipe Series I, II and III	3

With Overdrive

Hawk Series I, Ia and II	5
Super Snipe Mk. IV	7 $\frac{1}{4}$
Super Snipe Series I, II and III	5 $\frac{1}{4}$

Automatic Transmission

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Rear Axle Lubrication

Drain and refill after the first 500 miles and thereafter every 6,000 miles. Check the oil level every 1,000 miles. A drain plug and a level plug are provided; fill through the latter until oil just overflows.

It is most important that the correct grade of oil is used in spiral-bevel and hypoid axles, each of which has its appropriate (and different) grade. See table at end of chapter.

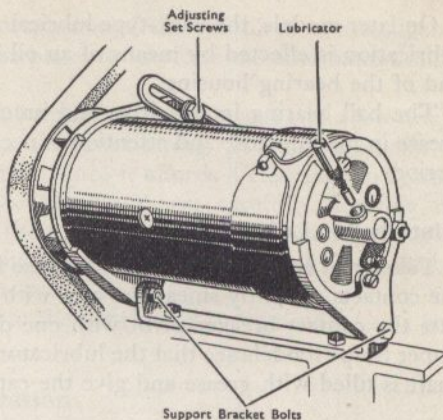
REAR AXLE OIL CAPACITIES

Hawk Mk. III onwards and Super Snipe Series I to III	1 $\frac{3}{4}$ pints
Snipe, Pullman, Super Snipe to Mk. IV and Hawk Mk. I and II	4 pints

Wheel Bearings and Universal Joints

The taper-roller front-wheel bearings should be dismantled, cleaned, repacked with grease and readjusted every 12,000 miles. Rear-wheel bearings should be sparingly lubricated every 6,000

FIG. 4.—SHOWING
GENERATOR LUBRI-
CATOR AND ADJUSTING
BOLTS.



miles. Use only a good quality roller-bearing grease. Latest models have no lubricators on the rear hubs; they are lubricated internally from the rear-axle oil.

Universal joints and sliding splines should be lubricated every 1,000 miles with E.P. 140 gear oil only.

Chassis Lubrication

Chassis lubrication is required at intervals of 1,000 miles. The table at the end of this chapter shows the various parts which require attention and the types of lubricant to be used, together with additional maintenance to be carried out at certain mileage intervals.

Gear oils of E.P. 140 viscosity are recommended for all points except wheel bearings, in which a good quality roller-bearing grease should be used.

Generator Lubrication

Every 6,000 miles unscrew the cap of the lubricator fitted on the commutator-end bracket, lift out the felt pad and spring and about half fill the lubricator cap with grease as specified for wheel bearings.

Replace the spring and felt pad and screw the lubricator cap back into position.

On later models, the wick-type lubricator has been deleted and lubrication is effected by means of an oil hole drilled in the rear end of the bearing housing.

The ball bearing in the drive-end bracket is pre-packed with grease in manufacture and attention is necessary only at overhaul periods.

Distributor Lubrication

Take great care to prevent oil or grease from getting on or near the contacts. Lightly smear the cam with a little grease. Lubricate the contact-breaker pivot with one drop of engine oil. On Super Snipe models see that the lubricator cap for the distributor shaft is filled with grease and give the cap one turn. Add a few

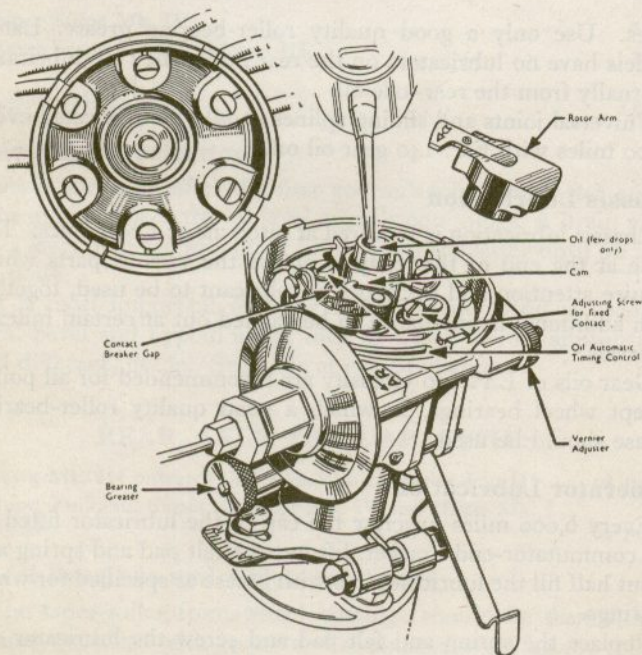


FIG. 5.—DISTRIBUTOR LUBRICATION AND MAINTENANCE.

drops of engine oil through one of the apertures at the edge of the contact-breaker base plate, to lubricate the automatic-timing control.

Lift off the rotor arm by pulling vertically and add a few drops of engine oil to lubricate the cam bearing. It is not necessary to remove the exposed screw, since it affords a clearance to permit passage of oil. Replace the rotor arm carefully, locating its moulded projection in the keyway in the spindle and pushing it on as far as it will go, in order to avoid the risk of the moulded cap being burned or tracked.

The above attention to the distributor is required every 3,000 miles.

Water-pump Lubrication

On Hawk models up to and including Mk. III, the front bearing is lubricated with engine oil every 1,000 miles. Add a few drops through the hole in the casting, accessible through the hole in the fan pulley. The rear bearing is lubricated by a greaser fitted to the top of the pump. Use water-pump grease and give the cap one turn every 1,000 miles.

On Super Snipe and Pullman a greaser only is fitted. As ball bearings are used fill the cap with roller-bearing grease and give the cap one turn after resistance is felt.

On later models no lubrication is required.

Front-wheel Bearings

Every 12,000 miles, the front hubs should be repacked with grease. This involves dismantling the hub assembly, but is a straightforward operation as taper-roller bearings are used and no hub puller is therefore required.

After the wheel has been removed and the hub detached by levering off and tapping, remove the split pin from the adjusting nut.

Fully unscrew and remove the castellated adjusting nut (these are right-hand threaded on all models on each side). Then carefully detach the tongued thrust washer and the outer-roller bearing if possible. If this outer-roller bearing cannot be readily withdrawn at this stage, pull the hub off the spindle. But take

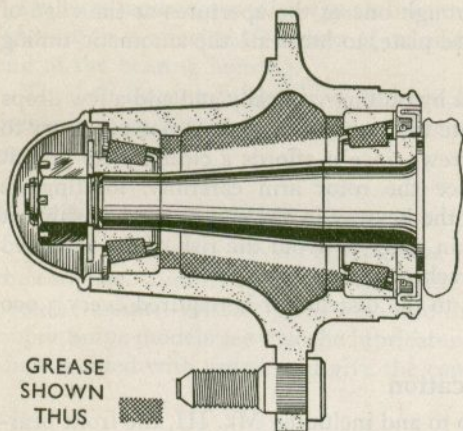


FIG. 6.—FRONT HUB LUBRICATION.

great care not to allow this bearing to fall to the ground, as it could readily pick up grit and dirt which is difficult subsequently to remove, and would cause damage if allowed to remain.

After removing the inner bearing, the hub can be washed out thoroughly and then repacked with fresh wheel-bearing grease: before replacing the hub and bearings on the spindle, make sure that there are no undue traces of grease around the inside of the brake back plates or near the brake shoe. Replace the seals if necessary.

Steering-gear Lubrication

There is a filler plug on the steering box of all models, and this should be removed when the steering gear is lubricated every 1,000 miles with E.P. 140 gear oil. When filled to the base of the filler-plug orifice, satisfactory lubrication is assured.

On latest models fitted with power-assisted steering, the reservoir should be checked and topped up with engine oil of S.A.E. 10 viscosity every 1,000 miles if necessary. A dipstick attached to the filler cap indicates the oil level.

All ball joints and swivel pins should be lubricated with gear oil at the pressure nipples.

GENERAL MAINTENANCE AND ADJUSTMENTS

Battery

Check the electrolyte level every 1,000 miles or more frequently in hot weather. Fill to the tops of the separators, so that the plates are just covered. Use distilled water only. Never top up with acid. A battery filler of the type which stops pouring when the electrolyte level is correct is a good investment.

Clean the terminals and smear with petroleum jelly periodically.

Hydraulic Brake- and Clutch-fluid Reservoirs

Check level and top up with Lockheed brake fluid, specification 70 R1 or R2, on all models except new Hawk Series II and Super Snipe Series II and III with disc front brakes. On these models a Girling system is used and Girling crimson brake fluid specification 70 R3 is recommended.

Hydraulic-clutch operation was introduced on the new Hawk Series I and Super Snipe Series I. All earlier models employ a mechanical linkage.

For details of bleeding, see the chapters on clutch and brakes.

Shock Absorbers

Topping up of lever-arm type units is not normally required in service and it is necessary to remove the shock absorber to top it up. Attention is therefore confined to checking the securing bolts every 6,000 miles.

Telescopic shock absorbers require no attention.

In isolated cases, weak shock absorbers may be restored by removing, fixing in a vice, topping up and expelling air by pumping the lever arm.

Front-wheel Track (Toe-in)

Correct toe-in adjustment is an important factor in tyre life, and should be checked every 6,000 miles. The front wheels should toe in $\frac{1}{8}$ in. in the laden condition. Other adjustments to the front suspension are described in the appropriate chapter.

Clutch Adjustment

A given clearance must be maintained between the pedal-linkage and the clutch-withdrawal lever in order to avoid clutch slip and undue wear. The clearance should be checked every 3,000 miles and adjusted, if necessary, as described in the clutch chapter.

Brake Adjustment

The brake-pedal travel should be checked every 3,000 miles and the shoes adjusted if this exceeds the normal amount of approximately one-third of the total movement. Shoe adjustment is carried out on most models through a hole in the wheel and brake drum, exposed after the nave plate is removed.

The handbrake cable should be adjusted if shoe adjustment does not take up the travel of the lever sufficiently. Normal maximum travel is six to eight notches on the ratchet. All adjustments are described in the brake chapter.

Distributor Adjustment

This is confined to checking the contact-breaker gap, cleaning, renewing, and adjusting the points when necessary and ensuring that the mechanical automatic advance is working by turning the rotor against its spring pressure in the direction of rotation and letting it return.

Most earlier distributors with an external vacuum-advance mechanism mounted on a separate bracket (type DKYH) around which the distributor body rotates have a contact-breaker gap of 0.012 in.

Later DKYH (Hawk Mk. V) and all DM-type distributors with built-in vacuum advance, in which only the distributor base plate turns, have a contact-breaker gap of 0.015 in. These latter distributors have high-lift cams with more prominent lobes.

The distributor cap should be kept clean and all high- and low-tension leads firmly secured. Ignition timing is described in the electrical system in a later chapter.

Sparkign Plugs

These should be cleaned and the points adjusted every 3,000

miles. Modern plugs are mostly of the non-detachable type and are best cleaned with sand-blasting equipment. Plugs should be renewed every 10,000 miles.

Fuel Pump

The fuel-pump filter should be cleaned approximately every 6,000 miles by removing the filter cover or the glass bowl, according to the type of fuel pump fitted. Wash the gauze in clean petrol and replace. Ensure that the cork seal makes a good joint when refitting the bowl or cover.

On Super Snipe and Pullman Mk. IV engines a Fram petrol filter is also fitted. Renew the element within the glass bowl every 6,000 miles.

Carburettors

The engine speed and mixture-adjustment screws should be set to give even idling at about 450-500 r.p.m. This adjustment is only carried out when required. Do not use force when adjusting mixture screws. The basis of this adjustment is to give the fastest possible even tick-over by weakening the mixture adjustment, with the engine speed-adjustment screw in the slow position. This is further described in the chapter dealing with the Fuel System.

The carburetter does not normally require cleaning at intervals within 12,000 miles, and this operation is covered under Fuel System, together with air-cleaner maintenance.

LUBRICATION AND MAINTENANCE TABLE

Daily

- Check engine oil level.
- Check water level in radiator.

Weekly

- Check tyre pressures and operation of all lights.

After 500 miles.

- Carry out lubrication service on new cars, change all oils.
- Check cylinder-head nuts or bolts for tightness. Check and adjust valve clearances. This also applies to reconditioned engines.

Every 1,000 miles

- Oil steering-king-pin bushes and ball joints. Oil front-suspension

fulcrum pins and bushes. Oil propeller-shaft universal joints and splines, using good quality hand oil gun. Oil brake and clutch pedals and linkage.

Check gearbox, overdrive if fitted, rear axle and steering-box oil levels. Check hydraulic brake and clutch cylinders where fitted. Check power-assisted steering reservoirs (where fitted). Oil dynamo (later models).

Every 2,000 miles

Drain engine sump and refill with clean oil.

Every 3,000 miles

Check fluid level in automatic transmission (when fitted).

Clean and adjust sparking plug and distributor contacts. Tune engine. Adjust brakes if necessary. Lubricate distributor. Adjust clutch if necessary. Change road wheels diagonally.

Every 6,000 miles

Renew oil-filter element. Change oils in engine, gearbox, overdrive (if fitted) and rear axle. Do not change oil in automatic transmission. Add grease to dynamo lubricator (early types).

Check steering track and camber and adjust if necessary.

Clean carburetter and fuel filters. Renew fuel-filter element (Super Snipe Mk. IV).

Clean air cleaner or silencer and re-oil. Check suspension and spring bolts for tightness. Examine brake pipes and connections. Check and adjust fan belt. Clean rear-axle breather hole.

Every 12,000 miles

Dismantle front hubs, repack with roller-bearing grease and adjust.

RECOMMENDED LUBRICANTS AND FLUIDS

Engine—On all engines up to and including Hawk Mk. VI and Super Snipe and Pullman Mk. IV, use an approved grade of S.A.E. 30 oil in summer and S.A.E. 20 in winter.

On Hawk and Super Snipe Series I and later engines use S.A.E. 20 oil for both summer and winter.

Gearbox and Overdrive (If fitted).—Use S.A.E. 30 engine oil.

Automatic Transmission—Use Shell Donex T.6. or alternative of approved grade.

Spiral-bevel Rear Axle (Hawk Mk. I and II, Super Snipe Mk. I to III, Pullman Mk. I to IV).—Use Shell Spirax E.P. 140 gear oil or equivalent.

Hypoid-bevel Rear Axle (Hawk Mk. III and Super Snipe Mk. IV onwards).—Use Shell Spirax E.P. 90 or equivalent hypoid oil.

Steering Box.—Use E.P. 140 gear oil.

Power-assisted Steering.—Use engine oil of 10 W. viscosity.

CHAPTER III

DECARBONISING

WITH the choice of fuels available today, the formation of carbon in the combustion chambers of engines is of less consequence than it was a few years ago.

The need for decarbonising is now normally associated with a falling-off of engine power due to partial or total loss of compression resulting from the burning of exhaust valves after a considerable mileage has been covered.

The basic principles of decarbonising and re-seating the valves are described in the following paragraphs, in which side-valve and overhead-valve engines are separately covered.

SIDE-VALVE ENGINES

Removing Cylinder Head

All engines of this type were originally fitted with aluminium-alloy cylinder heads, although a few have been equipped with cast-iron heads as service replacements.

The fixing nuts of aluminium cylinder heads should be slackened and tightened only when the engine is cold, in order to avoid distortion of the head. Before attempting to lift the cylinder head, after the nuts and washers have been removed, it is recommended that a good quality penetrating oil or brake fluid is applied to each of the head studs.

After disconnecting the battery, drain the water from radiator and cylinder block. Remove air cleaner. Disconnect and remove top hose and distributor. Unscrew the nut securing the capsule of the thermometer in the cylinder head just behind the thermostat housing. Lift out the capsule and position carefully to one side.

Remove nuts and washers securing cylinder head, noting positions of special long nuts at air-cleaner bracket and oil-filter steady-bracket locations (Hawk).

Ease the head by tapping around the sides, and on top of the studs, with a mallet or hardwood block and hammer and raise by the careful insertion of screwdrivers between cylinder head and block at the three locations provided. Care must be taken not to damage the joint faces.

Any water which may be released on removing the head should be wiped out of the cylinders immediately, to prevent rusting.

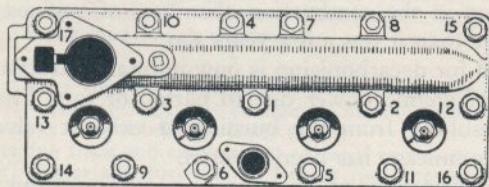


FIG. 1. (*above*).—SEQUENCE FOR SLACKENING AND TIGHTENING CYLINDER-HEAD NUTS ON HAWK SIDE-VALVE ENGINE.

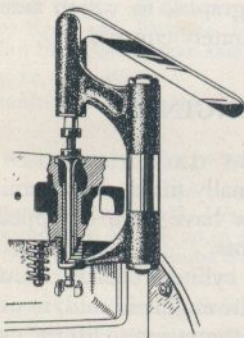


FIG. 2 (*left*).—VALVE-SPRING TOOL IN USE ON SIDE-VALVE ENGINE.

Removing Inlet and Exhaust Manifolds

This is a straightforward operation and will be assisted by applying penetrating oil to the nuts of the fixing studs and to the exhaust-flange nuts.

Note the position of the ring dowels which locate the manifold in position with the ports. These are fitted between the manifold and the gasket.

Removing Valves

Cover the top of the exhaust pipe with rag to prevent small

parts, etc., from falling into it. Remove valve cover by unscrewing the wing nuts, taking care of the joints and fibre washers under the wing nuts. Place clean rag over the holes in the bottom of the tappet chamber to prevent cotters or other small parts from falling through and eventually causing damage to the engine.

Turn engine by the starting handle until the valve to be removed first is in its closed position. Compress springs by means of a valve-spring compressor, located between the head of the valve and the valve-spring cup. Remove split-cone cotters. Release valve-spring compressor. Remove valve, noting its position, i.e. No. 1, etc., in readiness for replacement. Remove springs and cups.

Clean all parts that have been removed. Remove carbon from valve heads. Inspect valves and reject any with burnt seating faces or edges less than $\frac{1}{32}$ in. deep. Exhaust valves, if used again, will require refacing in a machine before they are fit for grinding in.

Decarbonise cylinder block and head as described later.

Grinding-in Valves

This operation will only be satisfactory if the valves and seatings are found to be in good condition. The valve stems must be straight and both these and their guides must be in good condition. Seatings in the block should not exceed approximately $\frac{1}{8}$ in. in width.

Place a small amount of valve-grinding paste (fine) evenly around the face of the valve to be ground, not allowing it to get on the stem. Then place the valve on its seating and, by means of a suction grinding tool or screwdriver, rotate the valve from side to side through a few degrees only, using light pressure. Frequently raise the valve and move round to a new position on its seating and continue grinding. If the valve does not fully locate on its seating with the valve tappet in its lowest position, the tappet should be adjusted to give clearance. To do this, slacken the locknut whilst holding the tappet barrel, and screw down the tappet screw (three spanners are desirable).

Grinding-in should be continued until valve face and seat are

evenly marked in grey all the way round, after both faces have been wiped with clean rag.

If a screwdriver is used for valve grinding, place a light coil spring under the head of the valve and around the stem. This will help the frequent lifting of the valve during grinding.

Decarbonising

As aluminium-alloy pistons are fitted, take care when decarbonising not to use sharp tools which might score the relatively soft surface. Any such scores would form a starting-point for carbon formation when the engine is reassembled. Detach the sparking plugs from the head and remove all carbon from the combustion space and block mating face. Keep carbon chips out of the water passages in the head and in the block.

When decarbonising the cylinder block, a ring of carbon will be present at the top of the bore; this is best left undisturbed, as also should a ring of carbon about $\frac{1}{8}$ in. wide around the top of the outside of the pistons. If an old piston ring is available, insert this when the piston is almost at the top of the bore, and it then provides a protection not only to the carbon already referred to on the cylinder wall, but also on the piston.

Carbon particles are abrasive and the following precautions should be taken. Apply grease to the cylinder bores and then turn the engine several times to circulate this, a proportion filling the space between the edge of the piston and the top ring. As each pair of pistons is brought to the top for decarbonising, the remaining bores should be stuffed with rag. To prevent carbon entering the water ports, these can either be plugged or a temporary cardboard gasket made with apertures only for the cylinder bores and studs.

When all the carbon has been removed by hand tools—do not use emery or other abrasives—and by blowing off or wiping clean, the value of greasing the cylinder bores will be apparent. As each piston traverses the bore it tends to leave behind on the cylinder wall a film of grease, in which is embedded any carbon which may have reached this point; clean this away. After turning the engine two or three revolutions, repeat the cleaning of the bores, to ensure that all carbon is removed.

Refitting Valves

See that the tappet is at its lowest position of travel in its guide. Insert the springs with the close coiled ends upwards, where such springs are used, and the spring cups in position under the springs. Place the top end over the location at the bottom of the valve guide, levering up from under the spring cup, using a broad screwdriver with the tip resting on the tappet screw. The spring assembly may then be pushed inwards and the screwdriver withdrawn.

Drop the valve into place after smearing the stem with engine oil.

By means of the compressor, compress the springs until the coils are not quite closed up, and it is still possible to move the lower end of the spring assembly laterally about the valve stem.

Smear the cotters with grease and work them into position around the base of the valve stem, ensuring that each cotter locates in its groove in the valve stem with the large end of the taper downwards. Gradually release the compressor and check that the cotters are properly located in the spring cup. Give the cup a light sideways tap to assist seating of these parts.

Remove rag from all openings protected during the foregoing operations.

Adjusting Valve-tappet Clearance

It is most important that the clearance between the head of the tappet screw and the base of the valve stem is checked and, if necessary, adjusted when the tappet is resting on the back or rounded portion of the cam contour.

Turn the engine until the valve to be checked is fully open; then a further revolution of the engine will ensure that the tappet is fully down and resting on the centre of the back of the cam. Treat each tappet similarly.

If adjustment is necessary, slacken the tappet locknut and turn the adjusting screw until the correct clearance of 0.010 in. is determined by the use of a feeler gauge, inserted between the valve stem and tappet screw head. To prevent the tappet itself from turning during this operation, hold the tappet body by means of a third spanner.

As each clearance is adjusted, the locknut below the tappet

screw must be tightened and the clearance checked again, to ensure that it has not been altered by tightening the locknut.

Valve clearance for all side-valve engines is 0.010 in. for inlet and exhaust valves.

Refit valve cover plate, using a new joint, and tighten wing nuts by hand.

Refitting Cylinder Head

After the head has been cleaned and all carbon removed, examine the joint face for corrosion. This face must be true and undamaged. Heads may be refaced if not warped more than 0.010 in.

Gaskets for all but the earliest engines are specially treated with varnish and fitted dry. Unvarnished gaskets should be greased lightly before fitting. Joint faces must be clean.

Aluminium cylinder heads should be tightened down only when cold. Therefore, when the engine has been run after refitting the head, it must be allowed to cool down completely before finally tightening down the nuts. Cylinder-head nuts should be tightened progressively, starting from the centre and working diagonally outwards.

Refitting Manifolds

Always use a new gasket when refitting the manifolds, and ensure that it is fitted correctly, so that the apertures in the gasket line up with the ports in the cylinder block.

Fit the ring dowels to the appropriate studs, denoted by the recesses in the manifold bolt holes, and see that they are present before refitting the manifold. Tighten the manifold nuts or bolts evenly, and re-tighten after the engine has been run. Fit a new exhaust-flange joint when connecting up the exhaust pipe. Ensure that the manifold drain tube is clear.

Additional Work Recommended

During the process of decarbonising, the ignition and petrol systems should receive attention, and the following should be checked:

Sparking Plugs.—Clean and reset gaps. Renew if necessary.

Distributor.—Remove contact-breaker points, renew if burnt or pitted, otherwise clean with a fine oil stone. Refit and reset gap. Lubricate automatic-advance mechanism and turn rotor in direction of rotation and see that it springs back. Dismantle and ease if necessary.

Carburettor.—Clean jets and float chamber. Clean petrol intake filter where fitted. Clean and re-oil air cleaner.

Fuel Pump.—Clean filter.

Fuller details for these operations will be found in the chapters dealing with the Electrical and Fuel Systems.

OVERHEAD-VALVE ENGINES

Removing Cylinder Head

Disconnect the battery. Drain the cooling system and save anti-freeze solution if in use. On the new Super Snipe Series I, II and III engines, place heater control in its 'Max' position to drain the heater hose before it is disconnected. Remove the water pump on Super Snipe Mk. IV engines only. Disconnect water hoses from pump and radiator and thermometer bulb from cylinder head, taking care not to damage the capillary tube (Hawk Mk. VI and Super Snipe Mk. IV). On later models disconnect the electrical-thermometer lead. Remove the rocker cover and valve-rocker assemblies.

On the new Super Snipe Series I to III engines, the rocker shafts should be lifted off by holding the front and rear standards, at the same time pressing inwards to prevent the assembly separating at the centre standard. Keep the parts together and take careful note of their location for correct reassembly. Remove manifolds after disconnecting controls.

Disconnect the oil-feed pipe to the rocker gear, remove the cylinder-head nuts or bolts and lift off the head. Note that the cylinder head is heavy and assistance should be obtained in lifting it. Protect the front wings, etc. to avoid scratching paintwork.

Valve Removal

The use of a valve-spring compressor is recommended, and its application for vertical and inclined valves is shown in Fig. 4.

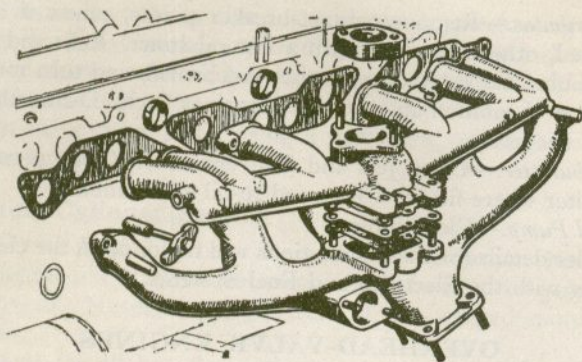


FIG. 3.—MANIFOLD ASSEMBLY OF SUPER SNIPE MK. IV O.H.V. ENGINE.

Compress the spring sufficiently just to remove the split-cone cotters; then remove the spring cup and springs. Dual-valve springs are used on all overhead-valve engines except the Super Snipe Series I to III. Neoprene sealing rings are used in the inlet-valve spring cups on all engines, to prevent oil being drawn down the valve guides. These rings are also fitted on the exhaust-valve stems on the new Super Snipe engines. Keep the spring cups in their correct order when dismantling, to enable them to be refitted in the same positions. This is vital on Hawk overhead-valve engines, as the inlet-valve spring cups are longer, and will foul the valve guides if fitted to the exhaust valves.

Decarbonising

Most of this work consists of cleaning the cylinder head, and can be carried out on the bench. Scrape away the carbon from ports and combustion chambers, not forgetting the sparking-plug apertures. Clean the cylinder-head face and finally wash the head in paraffin and leave to drain.

Clean the cylinder-block face and the piston tops, leaving an outer ridge of carbon about $\frac{1}{8}$ in. wide around the outside of the piston. Finally blow out and wipe the cylinder bores clean.

The exhaust valves should be refaced in a machine, or renewed if badly burnt or excessively thin on the outside edges between

valve seat and valve head; $\frac{1}{32}$ in. may be considered a minimum dimension at this point. If the seats in the cylinder head are badly burnt or cracked, the head should be given specialist attention.

Reassembling Valves

Give valve stems a thin coating of oil and replace each valve separately, in the correct order. Fit springs and spring cups, noting that on Hawk engines the inlet spring cups are longer than those of the exhaust, and are fitted with a sealing ring, which should be renewed.

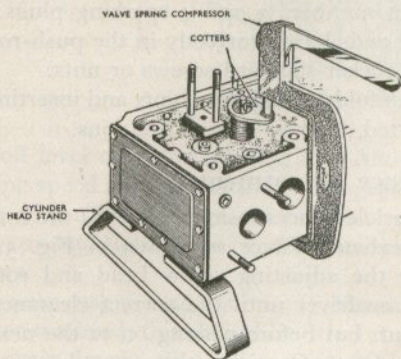


FIG. 4.—VALVE-SPRING TOOL IN USE
ON OVERHEAD-VALVE ENGINE.

Super Snipe and Pullman Mk. IV inlet valves are grooved to take a sealing ring on the valve stem itself and this sealing ring should be renewed. The oil shrouds should be placed in position on the inlet-spring cups.

On Super Snipe Series I to III engines, sealing rings are fitted to all valves.

Compress spring assembly and fit cotters around groove in valve stems. Release spring compressor, when the spring cup will grip the two halves of the cotters.

Refitting Cylinder Head

First of all ensure that the cylinder-block face is perfectly clean and apply a little oil to each cylinder bore. Then place the

cylinder-head gasket over the studs (position it over the dowels on the new Super Snipe engines). Gaskets are treated with varnish and require no grease. Ensure that the cylinder-head face is clean and place it in position with the aid of an assistant. Tighten the nuts or bolts a little at a time, working outwards and diagonally from the centre, until the head is firmly pulled down. Fit push rods.

Fit the rocker shafts and standard assemblies in the same order in which they were removed. Valve-stem caps are fitted on Super Snipe Mk. IV with high-compression heads (marked H.C.), between numbers 3 and 4 sparking plugs. Ensure that the rocker ball ends locate correctly in the push-rod cups before tightening the rocker-standard screws or nuts.

Refit the manifolds, using new joints and inserting the locating rings, when fitted, in their correct positions.

Valve-clearance Adjustment

Adjust rocker clearances, using a feeler of the correct thickness for inlet and exhaust valves as shown in Fig. 5. Release the locknut under the adjusting screw head and rotate screw by means of a screwdriver until the correct clearance is obtained. Tighten locknut, but before passing on to the next valve, again check the clearance. Continue this procedure until all valves have been checked. The valve clearance for all models is given in the engine data table (Chapter IV).

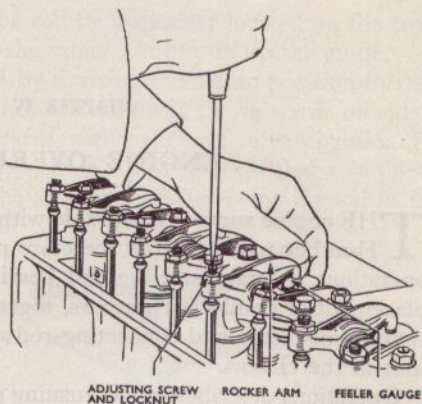
It is most important that the valve clearances are checked and adjusted when the tappets are resting on the back or rounded portion of the cam contour.

The simplest way of doing this is to rotate the engine by hand until the valve to be adjusted is fully open. Now turn the engine through one complete revolution; this will cause the camshaft to make half a revolution so that the base of the tappet is resting on the back of the cam.

Final Reassembly

Check to ensure that all controls, petrol and oil pipes are connected and tightened. Replace water hoses and heater pipes, where fitted. Fill the radiator. Check level again when hot.

FIG. 5.—ADJUSTING VALVE CLEARANCES ON OVER-HEAD-VALVE ENGINE.



Check the oil level and start the engine. Allow it to run at just above idling speed and inspect the rocker gear to ensure that oil is reaching all rocker bushings and push-rod cups. Run the engine until warm and tighten the cylinder head again. Recheck valve clearances.

Fit rocker cover, using a new joint. If excess oil spills with the rocker cover removed, this should be fitted at an earlier stage and removed again for the final adjustments. The head should be tightened again and the rocker clearances checked after approximately 100 miles.

It is advisable to change the engine oil after decarbonising, as particles of carbon may have found their way, via the tappet chest, etc., to the sump.

CHAPTER IV

ENGINE OVERHAUL

THE engine sump is removable with the unit in position on all Humber models. It is therefore possible to carry out such operations as main and big-end bearing shell renewal and replacement of crankshaft washers, together with the removal and refitting of piston and connecting-rod assemblies, with the engine unit in the chassis.

Operations described in the ensuing paragraphs deal with work which can be carried out with the engine in position. Engine removal and refitting and work necessitating this operation, are described at the end of the chapter.

Renewing Valve Guides

Remove cylinder head and valves as described in Chapter III. Special guide-withdrawal tools are available, but an alternative method is for the owner to use a threaded rod, distance piece and two nuts—the rod to pass down the guide.

The rod should be threaded at one end to a length approximately equal to that of the guide to be withdrawn, and at the other end sufficiently threaded to take a nut, whose hexagon must be filed to a diameter slightly less than that of the guide itself. Two flats should be filed at the tip of the long-threaded end of the rod to enable it to be gripped. The rod should be about $2\frac{1}{2}$ times longer than the guide. The distance piece should be about as long as the guide, with bore size slightly larger than guide diameter, and outside diameter large enough to seat at the top of the block or head.

Place a standard nut and washer of large outside diameter on the end of the rod already filed with two flats, pass it through the distance piece and locate the assembly over the guide to be withdrawn.

Screw the nut, already reduced in diameter, on to the other end

of the rod and, holding the rod by a spanner located on the two flats already filed, tighten the upper nut to pull up the guide.

Guides can be replaced by drawing them into position in the same direction in which they are removed, i.e. upwards on side-valve engines and downwards with overhead-valve engines. If the guides are driven into position it is important that a stepped soft-metal drift is used, the smaller diameter being a good fit in the bore of the guide itself.

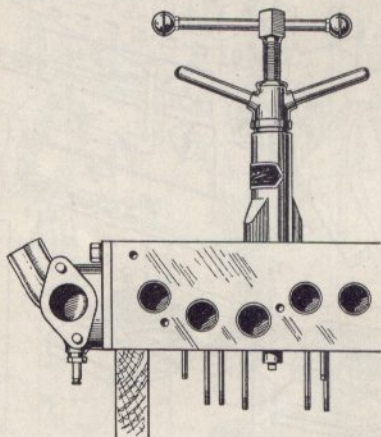


FIG. 1.—VALVE GUIDE REMOVAL.

The position of the guides in the cylinder block or head is also important, and fitted dimensions are given in the specifications at the end of this chapter.

New valves should normally be fitted if the guides are renewed, and the valves must be ground in.

Recutting Valve Seatings

A damaged or burnt seating may be corrected by means of a cutter tool of 45° angle, having a pilot which is a good fit in the valve guide. Such equipment is not normally found amongst the private owner's kit of tools, although information as to its use will be beneficial.

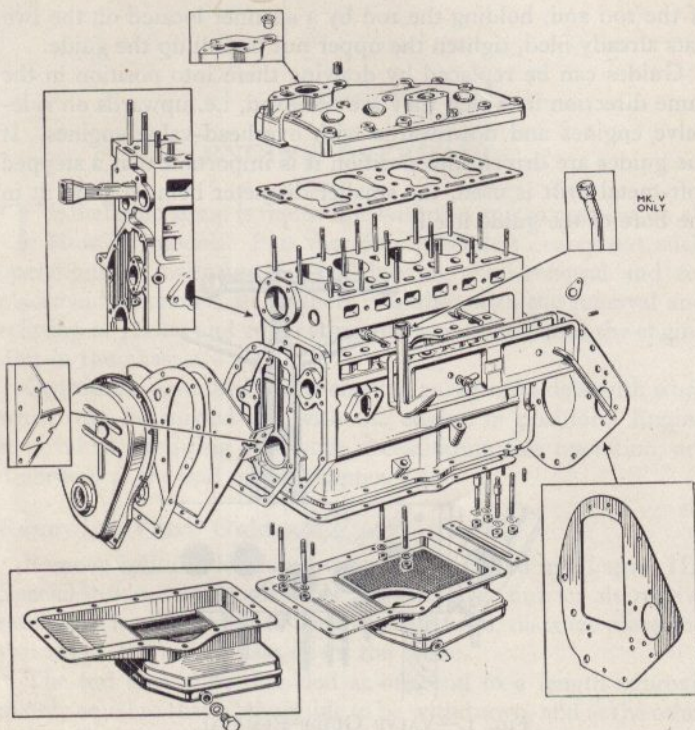


FIG. 2.—CYLINDER BLOCK AND ASSOCIATED PARTS OF HAWK MKS. III-V SIDE-VALVE ENGINE.

The insets apply to Mks. IV and V.

It is important that the highest degree of concentricity should exist between valve seatings and valve-guide bores.

Having fitted a new guide, cover up the base of the tappet chamber with clean rag, in order to prevent cuttings from entering the sump on side-valve engines. Cylinder bores and water holes should be blanked off. Place the cutter tool in position in the new valve guide and proceed to cut the face of the seating, revolving the cutter smoothly, using a steady downward pressure,

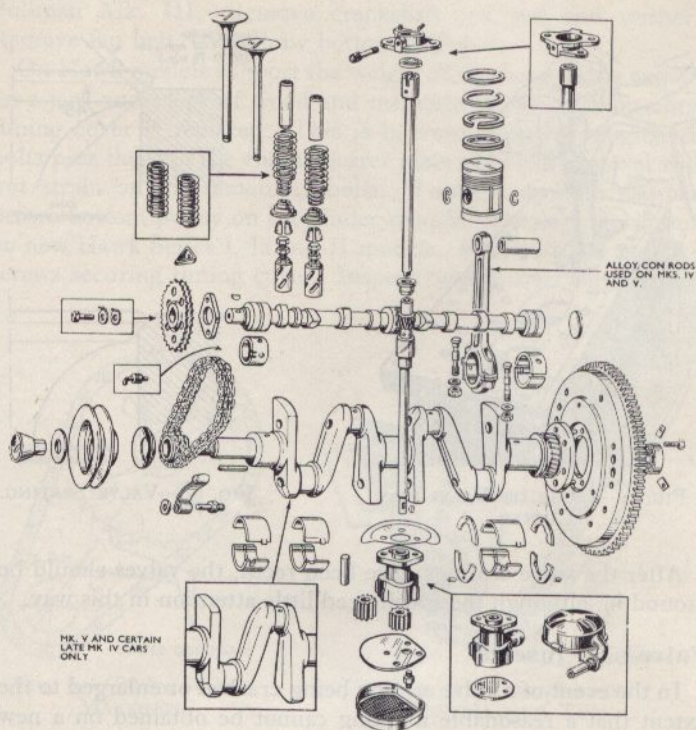


FIG. 3.—CRANKSHAFT, CAMSHAFT AND VALVE GEAR OF HAWK MKS. III-V SIDE-VALVE ENGINE.

The insets apply to Mk. IV and V.

in a clockwise direction. Continue cutting until all marks have disappeared, to a seating width not exceeding 0.070 in.

When the new face has been cut see that the valve, which may now be inserted for trial, is not brought too low on its seating, causing "pocketing". This condition may be rectified by means of a 15° angle-cutter tool. Occasionally it may be necessary to reduce the width of a seating face from the bottom edge, in which case a 75° cutter tool may be used.

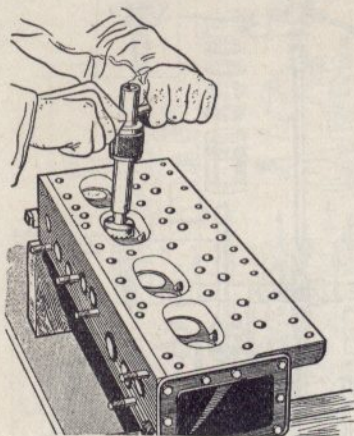


FIG. 4.— USE OF VALVE-SEAT CUTTER.

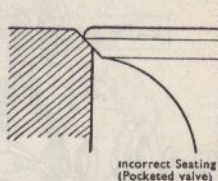
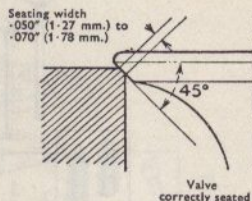


FIG. 5.—VALVE SEATING.

After the valve seatings have been recut, the valves should be ground in, although these will need little attention in this way.

Valve-seat Inserts

In the event of a valve seating being cracked or enlarged to the extent that a reasonable marking cannot be obtained on a new valve, it will be necessary for a new insert to be fitted, or added in the case of overhead-valve engines.

This work, which is very seldom needed, should be entrusted to specialists who have the necessary machining equipment.

Renewing Timing Chain

This operation is seldom necessary except during major overhauls, but in certain cases a timing chain will become noisy and, although the method of replacement varies slightly between different models due to the type of tensioner fitted, the following instructions will serve as a guide.

Remove radiator and detach grille to gain more access on Hawk models up to Mk. VI, Super Snipe models up to Mk. III and

Pullman Mk. III. Remove crankshaft jaw nut and washer. Remove fan belt. Withdraw bottom pulley.

On Hawk models support the weight of the front of the engine on a jack and block of wood and maintain in this position until timing cover is replaced. This is because several timing-cover bolts pass through the engine bearer plate and their removal will put strain on the remaining bolts. Remove vibration damper before bottom pulley on 6-cylinder models. Remove distributor on new Hawk Series I, Ia and II models. Remove bolts and set-screws securing timing cover. Inspect timing-cover oil seal and

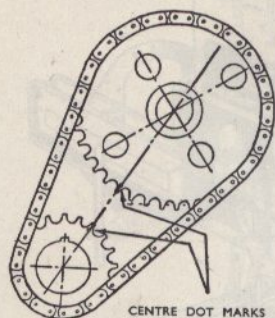


FIG. 6.—TIMING-WHEEL MARKINGS.

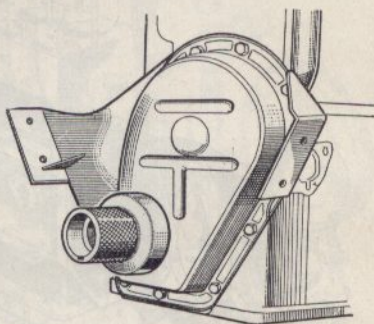


FIG. 7.—TIMING-COVER CENTRALISING TOOL.

renew if necessary after removing cover. Remove chain tensioner by taking out split pin and washer from pivot stud and pull blade off forwards by hand (4-cylinder models).

On Super Snipe and Pullman side-valve models remove split pins holding tensioner to its studs and take off the unit complete.

On Super Snipe and Pullman Mk. IV models (O.H.V.) the tensioner, timing sprockets and chain are removed together, after releasing the three setscrews securing the tensioner body to the cylinder block. As the camshaft wheel is released, compress tensioner plunger.

On the new Series I to III Super Snipe engines, an oil-pressure assisted tensioner having a synthetic-rubber contact pad is used,

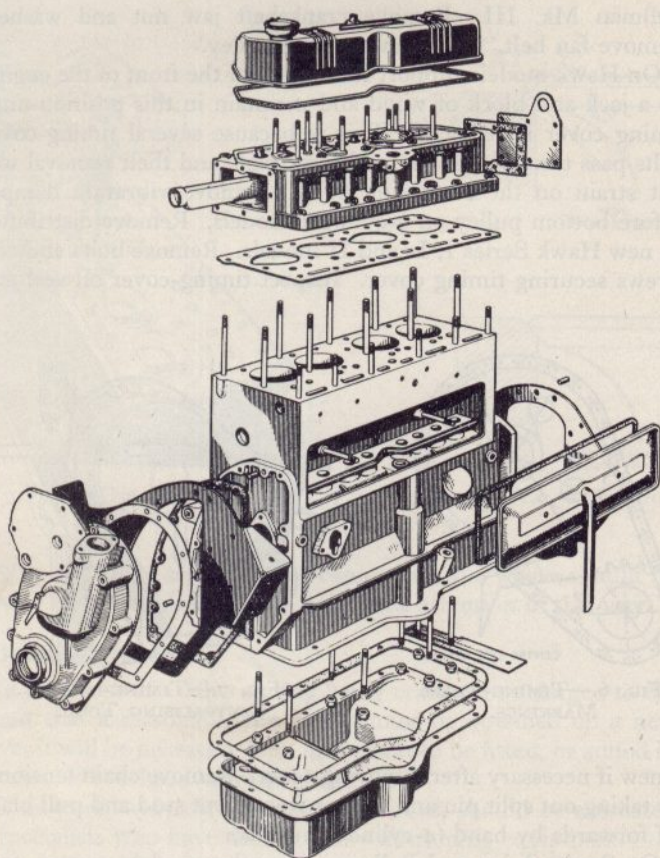


FIG. 8.—CYLINDER BLOCK AND ASSOCIATED PARTS OF
HAWK SERIES I, IA AND II O.H.V. ENGINE.

and this must be taken out prior to removal of the wheels and chain.

On Hawk models up to and including Mk. III (14 h.p.), the camshaft timing wheel is a fixture. Drive out one link to remove chain and fit new chain with spring link.

On all other models the camshaft and crankshaft sprockets

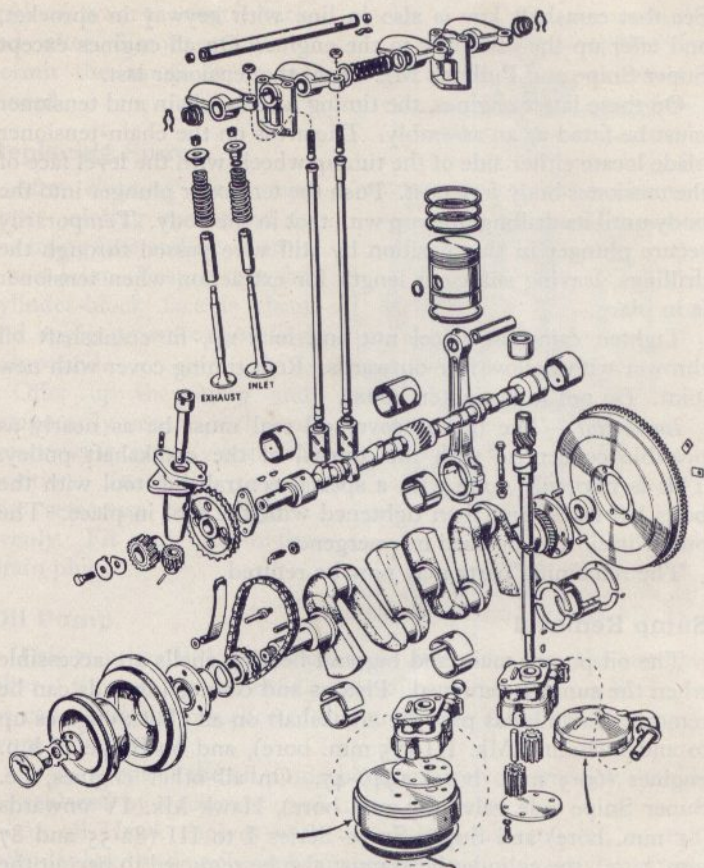


FIG. 9.—CRANKSHAFT, CAMSHAFT AND VALVE GEAR OF HAWK SERIES I, IA AND II O.H.V. ENGINE.

must be drawn or carefully levered off together, after removal of the camshaft-wheel retaining nut and lockplate.

When fitting a new chain and reassembling, turn crankshaft until the key is at top dead centre, assemble the two sprockets into the chain with timing marks on both wheels in line (see Fig. 6).

See that camshaft key is also in line with keyway in sprocket, and offer up the assembly to the engine. On all engines except Super Snipe and Pullman Mk. IV fit the tensioner last.

On these latter engines, the timing wheels, chain and tensioner must be fitted as an assembly. The areas on the chain-tensioner blade locate either side of the timing wheels with the level face of the tensioner body foremost. Push the tensioner plunger into the body until its drilling lines up with that in the body. Temporarily secure plunger in this position by stiff wire passed through the drillings, leaving sufficient length for extraction when tensioner is in place.

Tighten camshaft-wheel nut and lock up, fit crankshaft oil thrower with hollow face outwards. Refit timing cover with new joint. Do not fully tighten bolts.

Important.—The timing-cover oil seal must be as nearly as possible concentric with the journal of the crankshaft pulley. This is normally done with a special centralising tool with the bolts left slack, and then tightened with the tool in place. The pulley itself may be used in emergency.

The remaining parts may now be refitted.

Sump Removal

The oil pump, main and big-end bearing shells are accessible when the sump is removed. Pistons and connecting rods can be removed downwards past the crankshaft on all Hawk engines up to and including Mk. III (75 mm. bore), and on Snipe 18 h.p. engines (69.5 mm. bore) 1946-47. On all other engines, i.e. Super Snipe side valve (85 mm. bore), Hawk Mk. IV onwards (81 mm. bore) and Super Snipe Series I to III (82.55 and 87 mm. bore), the cylinder head must also be removed to permit the piston and upper half of the connecting rod to be withdrawn upwards.

The floating-level oil-pump intake filter, where fitted, is easily removed for cleaning by removal of the split pin, and must be taken off to permit access to bearing caps, etc.

Remove the dipstick (and unscrew dipstick tube on Hawk engines). Remove dust cover at rear end of sump. Drain the oil. Remove fixing setscrews and detach sump. On new Series I

engines, lower the centre track rod after disconnecting, to permit the sump to be removed.

Replacing Sump

After cleaning the sump, apply jointing compound to the fixing face and place on it a new joint. Ensure that the cylinder-block face is clean and apply grease or jointing compound.

Offer up the sump and temporarily secure with two setscrews in suitably opposed positions. Insert the remaining setscrews and tighten evenly. Fit and tighten the drain plug.

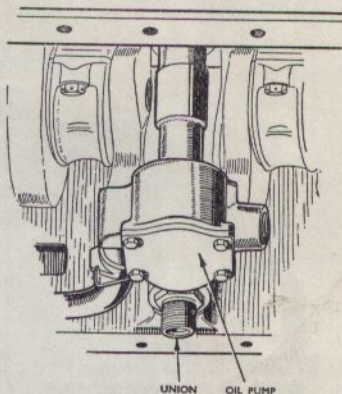
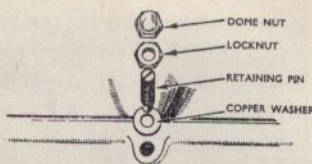


FIG. 10.—OIL-PUMP LOCATION ON SUPER SNIPE AND PULLMAN MK. IV.

Oil Pump

This requires little attention apart from cleaning the suction filter if the sump is removed. Low oil pressure is more likely to be caused by the presence of dirt under the relief valve, or by a worn valve or ball.

In the event of the oil pump being excessively worn, it should be replaced by a reconditioned unit.

On all Hawk engines with the distributor mounted on the cylinder head and on Super Snipe and Pullman side-valve engines, removal of the oil pump will disturb the ignition timing. On these engines set No. 1 piston at top dead centre on the compression stroke. Remove the distributor cap and take a note of the position in which the rotor is pointing. Now remove the distributor and sketch the location of the offset-tongue drive at the tip of the distributor driving shaft. Lift out the shaft.

The oil pump can now be removed, after sump removal on

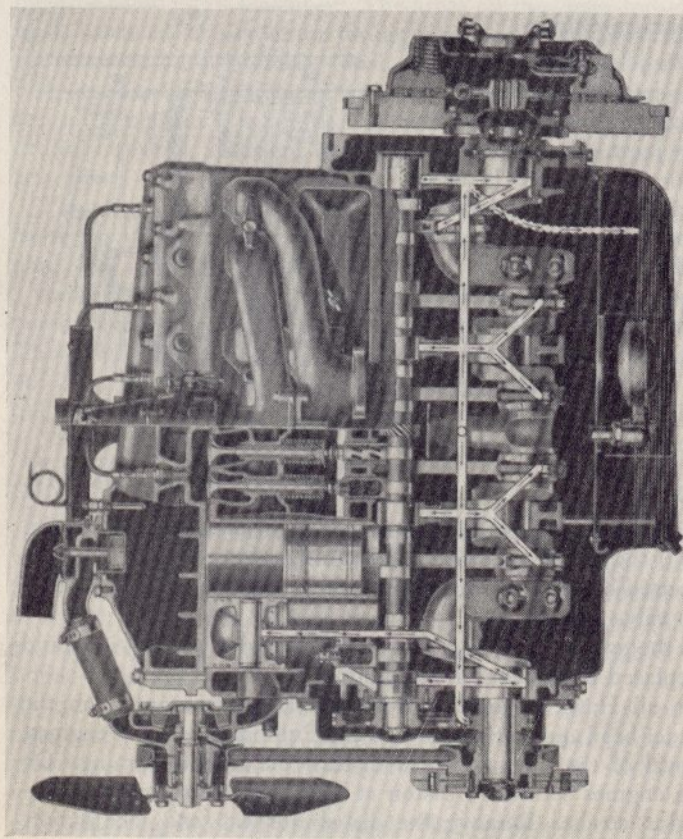


FIG. 11.—LONGITUDINAL SECTION OF SUPER SNIPE AND PULLMAN SIDE-VALVE ENGINE.

Oil flow is indicated by the arrows.

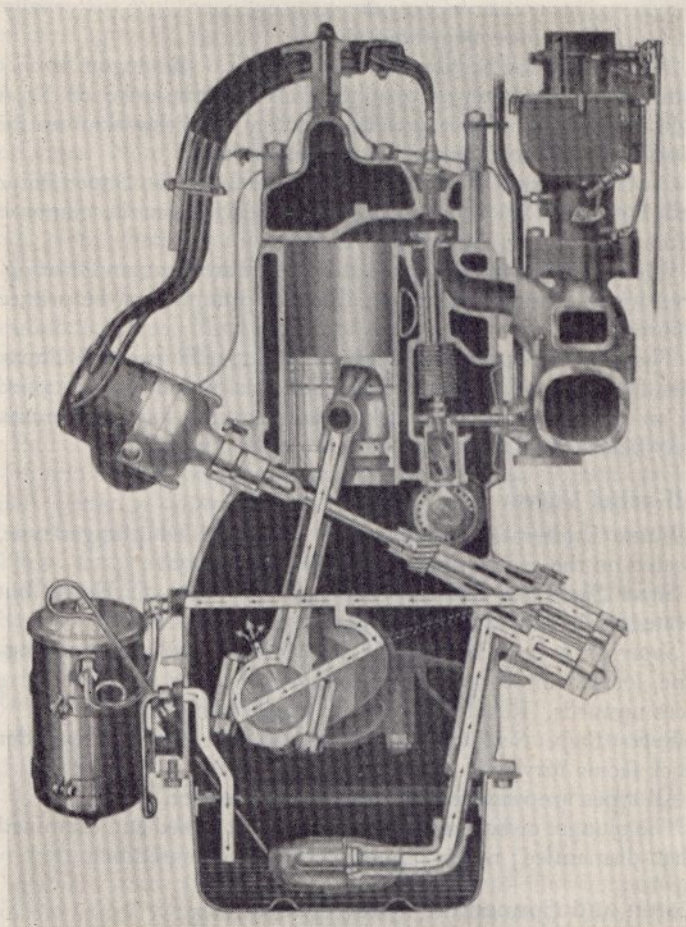


FIG. 12.—CROSS SECTION OF SUPER SNIPE AND PULLMAN SIDE-VALVE ENGINE.

Oil flow is indicated by the arrows.

Hawk engines and from the side of the cylinder block (externally) on 6-cylinder side-valve engines.

Much time will be saved on reassembly if the engine is once again turned to obtain t.d.c. on the compression stroke, on No. 1 cylinder and the oil pump refitted so that the drive assumes the position you have sketched before dismantling.

On Hawk engines after the new Series I and on Super Snipe and Pullman O.H.V. engines, the oil pump can be removed without disturbing the ignition timing.

When refitting ensure that suction filters are clean and floating-level intakes free in operation. External pumps must be primed before fitting.

The oil-pump location is different on Super Snipe and Pullman Mk. IV engines from that of all others, as the pump is retained by an external grub screw, locknut and cap nut, located immediately below the distributor.

Oil-relief Valve

Hawk Engines.—Non-adjustable spring-loaded plunger-type, located on the centre right-hand side of the engine.

Super Snipe and Pullman Side-valve Engines.—As Hawk, but located on left-hand side of engine behind oil pump.

Super Snipe and Pullman Mk. IV (O.H.V.).—Ball and spring-type, located in oil-filter body facing to the rear. By-pass valve faces upwards. Relief valve has stronger spring.

Super Snipe Series I to III.—Located at front of cylinder block facing forward.

All types are removed by unscrewing hexagon cap.

The plunger or ball, and seating must be cleaned and examined when dismantled; renew plunger or ball if indented or pitted.

Piston and Connecting-rod Removal

Pistons and connecting rods can be removed with the engine in place on all models, although the cylinder head, as well as the sump, must be removed on all engines except Hawk up to and including Mk. III (75 mm. bore) and Snipe 18 h.p. (69.5 mm. bore). On these engines the pistons are small enough to pass the crankshaft webs and are removed downwards. On all later

engines, the piston and upper half of the connecting rod are removed upwards through the cylinder bore.

Hawk up to Mk. III and Snipe 18 H.P.—Remove sparking plugs, drain and remove the sump (and floating filter on Snipe). Release lockwashers or split pins and remove nuts securing big-end caps. Note numbering on side face of rod and cap, these numbers must be on the same side and the same number, to ensure that the cap is fitted the right way round and to the right rod. Note whether numbers face to offside or nearside.

Remove cap and bearing shell. Push connecting rod which is being removed up the cylinder bore until big end is free of crankshaft. Turn the engine gently so that the crank of the particular connecting rod being removed is opposite to the one facing the camshaft, i.e. No. 1 being removed, Nos. 2 and 3 face camshaft.

Pull connecting rod down until the piston is out of the cylinder bore and resting on crankshaft balance weights. Rotate crankshaft gently in opposite direction to normal rotation and withdraw the piston and connecting rod. Refit shell and cap. On 18 h.p. Snipe, direct-metalled rods are used.

All Later Engines.—Remove the cylinder head in addition to the work outlined above and push the piston and connecting rod up through the bore.

Removing Pistons from Connecting Rods

Hawk Mk. I and II gudgeon pins are retained in the small end of the connecting rods by clamp bolts.

Hawk Mk. III and all 6-cylinder engines have steel connecting rods with bushed small ends, the gudgeon pins being retained by circlips in the piston bosses.

Hawk engines after Mk. III have duralumin-alloy connecting rods in which the gudgeon pin is an interference fit. Circlips are used in the pistons.

On Hawk Mk. I and II insert a short bolt into the bore of the gudgeon pin at each end, the bolt hexagon being slightly smaller than the gudgeon-pin bore in the piston. Clamp the assembly on the bolt heads in the vice with the clamping bolt upwards. Loosen and remove the clamp bolt. Release from the vice and,

with a suitable drift, just smaller than the gudgeon pin, drive out the pin and release the piston. Hold the piston in the hand during this operation and note which way round the piston is fitted, in relation to the connecting rod.

On Hawk Mk. III and all 6-cylinder engines, remove the circlips retaining gudgeon pin in piston with suitable pliers. Scrape away any carbon which may have accumulated in the outer ends of the piston bosses to facilitate removal of the gudgeon pin. Push or drive out the gudgeon pin. If at all tight, dip piston crown in hot water to expand the gudgeon pin bosses in the piston.

On Hawk engines with alloy rods, removal of the piston is best left to Rootes Dealers, as it is necessary to heat the small end of the connecting rod and the piston crown in oil to a temperature of approximately 250° F. and the equipment required for this work is normally beyond the reach of the private owner. The small end of the alloy rod is not bushed and the diameter of the gudgeon pin is approximately 0.0005 in. larger than the bore of the small

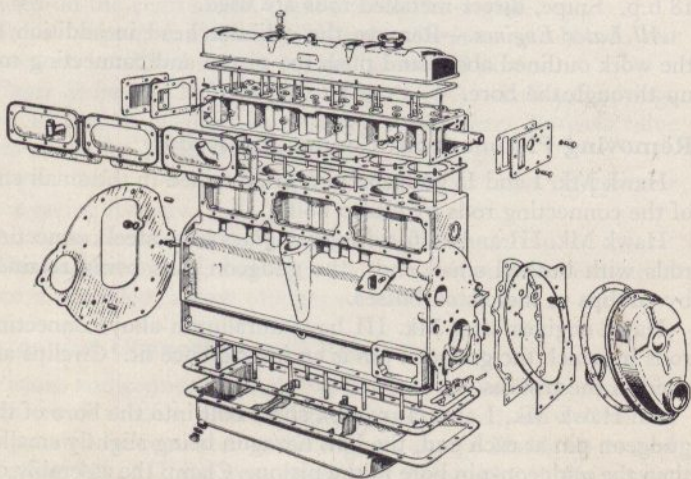


FIG. 13.—CYLINDER BLOCK AND ASSOCIATED PARTS OF SUPER SNIPE Mk. IV O.H.V. ENGINE.

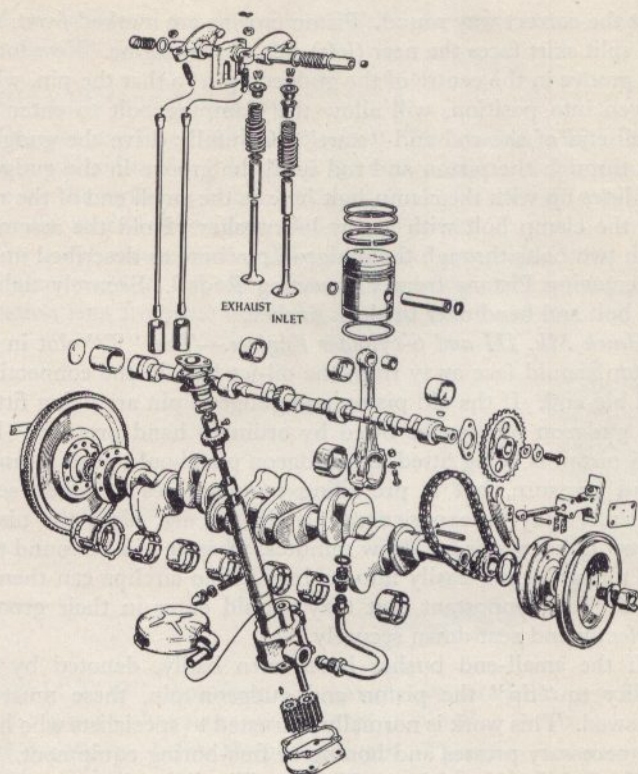


FIG. 14.—WORKING PARTS OF SUPER SNIPE MK. IV O.H.V. ENGINE.

end. The use of heat as mentioned is therefore essential to permit removal and refitting of the pin without damage to the rod.

Refitting Pistons to Connecting Rods

Hawk Mk. I and II.—If either the original or new pistons are being fitted, the piston should first be dipped in hot water and the gudgeon pin removed sufficiently to allow the piston to be positioned over the small end of the rod. Keeping in mind the side of the engine towards which the connecting rod numbers—on the big-end sides—face, hold the rod and offer up the piston

to it the correct way round. Piston crowns are marked *front*, and the split skirt faces the near (left) side of the engine. Now locate the groove in the centre of the gudgeon pin so that the pin, when driven into position, will allow the clamping bolt to enter the small end of the rod and "start". Carefully drive the gudgeon pin through the piston and rod until the groove in the gudgeon pin lines up with the clamp-bolt hole in the small end of the rod. Fit the clamp bolt with a new lockwasher. Hold the assembly with two bolts through the gudgeon pin bore as described under "Removing Pistons from Connecting Rods". Securely tighten the bolt and bend over the lock washer.

Hawk Mk. III and 6-cylinder Engines.—The "T" slot in the piston should face away from the oil-jet hole in the connecting-rod big end. If the old piston and gudgeon pin are being fitted, the gudgeon pin can be fitted by ordinary hand pressure. If a new piston is being fitted, the gudgeon pin should push in under hand pressure, but if prevailing temperatures are low, some difficulty may be experienced. If this occurs, place the piston crown in hot water for a few minutes, when it will be found that the pin will enter easily into its bore. The circlips can then be fitted. It is important that they should enter in their grooves perfectly and seat down securely.

If the small-end bushes have worn badly, denoted by the ability to "tip" the piston and gudgeon pin, these must be renewed. This work is normally entrusted to specialists who have the necessary presses and honing or fine-boring equipment.

Hawk Mk. IV and Later Models.—The light-alloy connecting rods fitted to these engines demand a very critical interference fit of the gudgeon pin in the small end of the rod, which is fine-bored in manufacture to provide a "nip" of 0.0005 in. Unless equipment is available for heating the small ends to a temperature of 250° F. in oil, the servicing of these rods and their pistons is best left to Rootes Dealers or specialists in this type of work.

It is most important that the above fit is preserved to avoid small-end rattle when hot, but if the rods have been correctly serviced previously, or are the originals, this problem will not present itself.

Gudgeon pins 0.003 in. oversize are available and the small

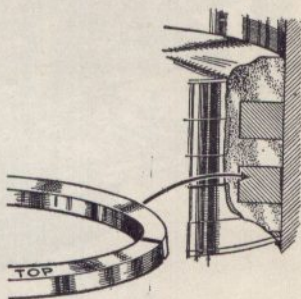
end can be honed out oversize to restore the same interference fit as originally specified.

Fitting Pistons and Rings

Engines are fitted with aluminium-alloy pistons with a "T" slot machined in the side of the skirt which faces the non-thrust side of the cylinder bores. That is the left-hand side looking from the rear of the engine towards the front.

On 4-cylinder engines, the pistons are assembled with compression rings in the top piston-ring grooves, the second-compression ring from the top being tapered and fitted with the face

FIG. 15.—FITTING TAPERED SECOND PISTON RING.



marked "TOP" uppermost. A maxigroove scraper ring is fitted in the groove above the gudgeon pin. No ring is fitted in the bottom groove—below the gudgeon pin. This groove is provided for the addition of a second scraper ring in service use only, should it be found that oil consumption has increased after a considerable mileage.

After reboring and fitting oversize pistons, cylinder conditions should exist which are comparable to new, and the lower scraper ring should not be fitted until oil consumption indicates that it is required. Otherwise excess wear may be caused by excessive oil control.

It should be noted that lower scraper rings are of the pegged type; a peg is inserted in the groove to keep the ring in correct position relative to the drain holes in the groove by preventing rotation.

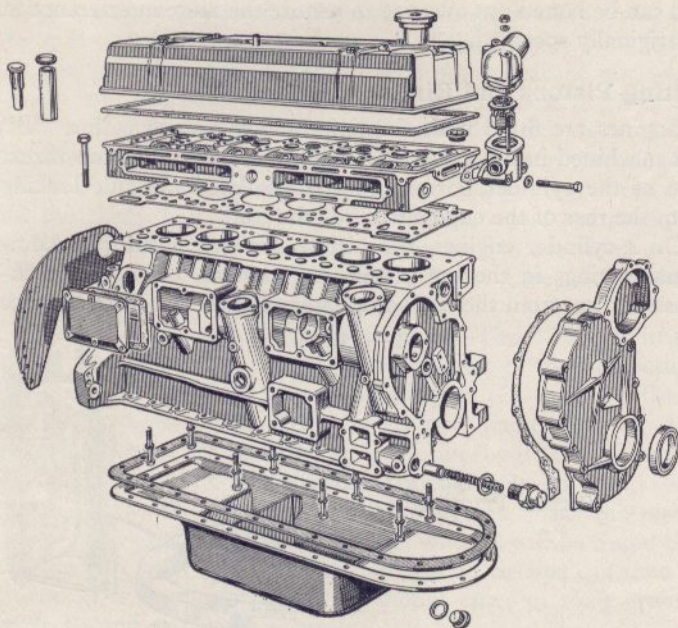


FIG. 16.—CYLINDER BLOCK AND ASSOCIATED PARTS OF SUPER SNIPE SERIES I AND II O.H.V. ENGINE.

Series III block similar except for distributor mounting position which slopes forward.

On Super Snipe and Pullman Mk. I to IV, a plain ring was originally fitted in the bottom groove, below the gudgeon pin. This can be replaced by a scraper ring, similar to the upper scraper ring, for improving oil control after considerable mileages.

It will be appreciated that if the rings alone are being renewed, they must be the same size as the piston, i.e. if the pistons are 0.010 in. oversize, rings must also be 0.010 in. oversize. The piston size will be found stamped on the piston crown.

The ring grooves must also be in reasonable condition and free from appreciable up and down play between ring and groove.

In order to ensure that the ring gap, when the piston is fitted to the cylinder bore, will be within the correct limits as given in

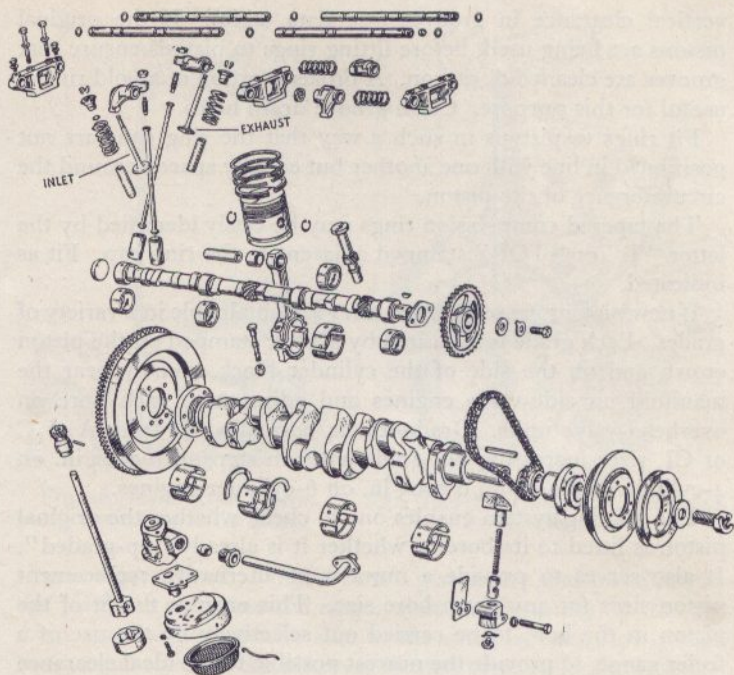


FIG. 17.—CRANKSHAFT, CAMSHAFT AND VALVE GEAR OF SUPER SNIPE SERIES I TO III O.H.V. ENGINE.

the data table, scrape away any carbon from the top of the cylinder bore—above the travel of the piston rings. Compress the ring to be tested and carefully insert it into the top of the bore. Now insert the piston, crown downwards, into the top of the bore until it just touches the ring and allow it to square up the ring. Do not press the piston down too far, as the ring must be checked in the least worn part of the bore right at the top. Check the gap with a feeler gauge and adjust with a small file if required. File the gap squarely and remove any burrs. Use the file carefully as rings are brittle.

Fit rings to piston so that rings checked in No. 1 cylinder are fitted to No. 1 piston, and so on. With a feeler gauge check for

vertical clearance in grooves (see data table). If the original pistons are being used, before fitting rings to pistons ensure that grooves are cleaned of carbon. A broken portion of an old ring is useful for this purpose. Clean groove drain holes.

Fit rings to pistons in such a way that the ring gaps are not positioned in line with one another but equally spaced around the circumference of the piston.

The tapered compression rings may be easily identified by the letter "T" or "TOP" stamped adjacent to the ring gap. Fit as indicated.

If new pistons are to be fitted, they are obtainable in a variety of grades. Each grade is indicated by a letter stamped on the piston crown and on the side of the cylinder block, usually near the manifold on side-valve engines and adjacent to each bore on overhead-valve units. Grade letters normally run from A to C or CI, sizes increasing per grade letter in steps of 0.0004 in. on 4-cylinder engines and 0.0005 in. on 6-cylinder engines.

The grading system enables one to check whether the original piston is fitted to its bore or whether it is already "up-graded". It also serves to provide a number of alternative replacement piston sizes for any given bore size. This enables the fit of the piston in the bore to be carried out selectively by the use of a feeler gauge, to provide the nearest possible to the ideal clearance between piston skirt and cylinder bore after reboring or, to a lesser extent, when fitting new pistons to bores which are not worn sufficiently to warrant reboring.

The feeler-gauge clearances are specified in the data at the end of this chapter.

Refitting Pistons and Connecting Rods

On all engines check that pistons are assembled to connecting rods correctly, i.e. with slot in piston on opposite side to squirt hole in connecting-rod big end. The slotted side of the piston always faces the left-hand side of the engine and the oil squirt hole in the rod always faces the right-hand side of the engine, when viewed from the rear. See that big-end caps are the right way round.

Hawk Mk. I to III and Snipe 18 h.p.—Use a suitable piston-

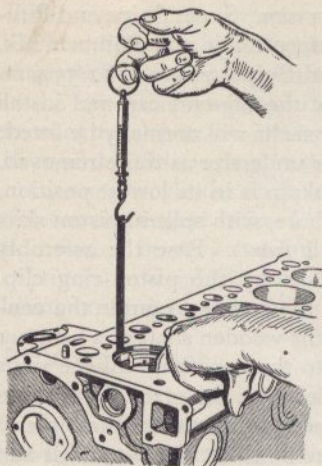


FIG. 18.—CHECKING PISTON CLEARANCE WITH FEELER.

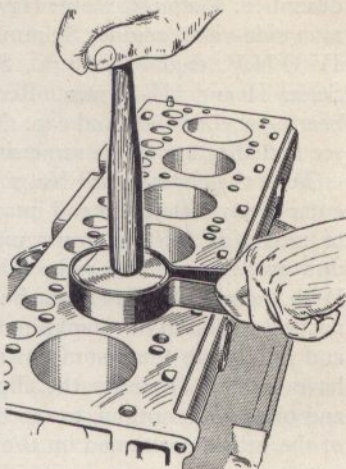


FIG. 19.—PISTON-RING COMPRESSOR IN USE.

ring compressor of 75 or 69.5 mm. piston size and place it over the piston to compress the rings. Pass the assembly up into the crankcase on the opposite side to the camshaft and slowly turn the crankshaft until the piston is located beneath its bore.

Enter the top land of the piston into the bore and carefully push the assembly upwards through the clip (ring compressor) until all rings have entered the cylinder. Push the piston up until the bottom of the skirt is flush with the bottom of the bore and remove the clip.

See that the crankpin is clean and oiled, check that the bearing shell is correctly fitted in the rod and pull the rod down on to its crankpin. Fit the cap and shell. Fit the nuts and lockwashers. Tighten the nuts and check for freedom of movement. Bend over tab washers (fit split pins in 6-cylinder engines).

Hawk Mk. IV onwards, Super Snipe and Pullman Mk. I to IV, Super Snipe Series I to III.—On these engines the cylinder head must be removed and the pistons and connecting rods, less bearing caps, entered through the top of the cylinder bores.

Compress the piston rings with a suitable clip as already

described. Piston sizes are: Hawk 81 mm., Super Snipe and Pullman side-valve engines 85 mm., Super Snipe and Pullman Mk. IV O.H.V. engines 89 mm., Super Snipe Series I 82.55 mm. Series II and III 87 mm. Remove the big-end cap and install bearing shells in rod and cap. New shells will normally be fitted; see that they are of the same size or undersize as those removed.

Turn the engine until No. 1 crankpin is in its lowest position, enter No. 1 piston and rod into its bore, with split in piston skirt to near side (piston crown marked *front*). Ease the assembly downwards until the weight is taken by the piston-ring clip. With the aid of an assistant below the engine to guide the connecting rod on to the crankpin, use the wooden shaft of a hammer and lightly tap the piston down into the bore until all the rings have entered. Remove the clip. See that the crankpin is clean and oiled and continue to tap the piston down until the big-end of the rod is positioned on the crankpin. Fit the cap, shell and nuts.

Engine Removal and Refitting

This work will not normally be within the scope of the private owner, mainly because engine removal necessitates the use of lifting tackle. If this is available, however, procedure for engine removal is similar for all models with 4-cylinder engines, where the engine is separated from the gearbox, the latter being left in position in the chassis.

This work involves removal of the bonnet, radiator, battery and cradle and front floor centre section. Then disconnect exhaust pipe at manifold flange, all relevant controls and electrical connections and gearshift mechanism where it is connected to the engine near the rear-support plate.

Disconnect engine tie rod, where fitted, between rear mounting plate and cross member, and engine stabiliser link (Hawk Mk. VI). Remove crankshaft jaw nut and pulley and place a wire or heavy-duty hemp rope around the unit to pass below the rear of the sump, behind the rear sump wall, and below the front timing cover, the hook of the lifting tackle to pick up the rope above the centre of the cylinder head. Adjust tension of lifting gear so that the weight of the engine is just taken—not lifted.

Remove engine front-mounting rubber to frame setscrews. Remove upper bellhousing bolts. Now place a jack under base of gearbox to support it, but not to lift it. Chock the rear wheels of the car. Remove remaining bellhousing bolts and ease engine forward from gearbox bellhousing. Do not tilt the engine until clear of the bellhousing, or the clutch unit will be strained.

On most 6-cylinder engines, the gearbox is removed at the same time as the engine unit. On Super Snipe Mk. IV the gearbox unit should be removed first, before removing the engine. The considerable weight of these units makes the use of heavy-duty lifting equipment essential.

Refitting Engine

Before starting to install the unit, a general check should be made of all mounting locations to see that they are not bent or damaged; the mounting rubbers should be renewed if necessary. Ensure that such items as cylinder-block core plugs, which are now readily accessible, are replaced if leaking or corroded, before the unit is refitted. Ensure that bellhousing dowels are in position and that faces are clean, to ensure correct location when bolted up.

Lightly smear a little white grease, such as Shell SB 2498, on to the gearbox primary-shaft splines to assist free axial movement of the clutch driven plate when assembled. Treat all pivot points in the clutch unit before fitting with a small amount of this grease; apply with a penknife. Thoroughly clean the front of the chassis or underframe, particularly around the engine-mounting points.

When arranging the sling around the engine, take the weight with the lifting equipment to ensure that the engine assumes its correct position, with rear end slightly down, in order to make installation as easy as possible.

If the clutch unit has been dismantled, centralise the driven-plate splines with the spigot bearing in the centre of the crankshaft rear flange to ensure easy entry of the gearbox primary shaft into the clutch. This can be done with the use of a special centralising tool, an old gearbox primary shaft or with a piece of wood turned up in a lathe, with diameters to suit the bore of the crankshaft spigot and of the driven-plate splines. This tool

HUMBER CARS

ENGINE SPECIFICATION

	<i>Hawk</i>	<i>Snipe</i>
Bore (mm.)	75 (Mk. I-III) 81 (Mk. IV onwards)	69.5
Stroke (mm.)	110	120
Capacity (c.c.)	1,944 (Mk. I-III) 2,267 (Mk. IV onwards)	2,732
Compression ratio	6.40:1 (Mk. I-III) 6.32:1 (Mk. IV-V) 7.0:1 (Mk. VI) 7.5:1 (Series I to II)	6.4:1
Compression pressure (lb/sq. in.)	112-120 (Mk. I-V) 140 (Mk. VI) 145 (Series I and Ia)	105
Brake horse power at r.p.m.	56/3,800 (Mk. I-III) 58/3,400 (Mk. IV and V) 70/4,000 (Mk. VI) 78/4,400 (Series I to II)	65/3,500
Max. torque (lb-ft/r.p.m.)	97/2,000 (Mk. I-III) 110/1,800 (Mk. IV-V) 120/2,300 (o.h.v.)	120/3,000
Firing order	1,3,4,2	1,5,3,6,2,4
Valve timing, inlet opens b.t.d.c.	13° (Mk. I-V) 15° (Mk. VI onwards)	9°
Valve timing clearance (in.)	0.014	0.014
Valve working clearance (in.)	0.010 (cold, S.V.) 0.007, inlet (hot, O.H.V.) 0.009, exh. (hot, O.H.V.)	0.010 (cold)
Valve-seat angle	45°	45°
Valve-stem dia. (in.)		
inlet	0.3115-0.3120 (S.V.) 0.3417-0.3422 (O.H.V.)	0.3518-0.3524
exhaust	0.3115-0.3120 (S.V.) 0.3407-0.3412 (O.H.V.)	0.3505-0.3510
Stem clearance in guide (in.)		
inlet	0.0025-0.0040 (S.V.) 0.0015-0.0030 (O.H.V.)	0.0014-0.003
exhaust	0.0025-0.0040	0.0028-0.0043
Valve guide fitted ht. (in.)		
inlet	0.95 below top of block (S.V.) 0.71 above spring seat (O.H.V.)	To project $\frac{1}{16}$ into tappet chamber
exhaust	0.53 below top of block (S.V.) 0.86 above spring seat (O.H.V.)	To project $\frac{1}{16}$ into tappet chamber
Valve-head dia. (in.)		
inlet	1.386-1.390 (S.V.) 1.630-1.634 (O.H.V.)	1.543 -1.547
exhaust	1.307-1.311 (S.V.) 1.382-1.386 (O.H.V.)	1.386 -1.390
Crankshaft		
journal dia. (in.)	2.2490-2.2495	2.5605-2.5610
dia. clearance, main bearings	0.0003-0.002	0.0022-0.0032
crankpin dia. (in.)	1.93725-1.93725	2.1244-2.1252
dia. clearance big-ends (in.)	0.0005-0.002	0.0013-0.0015
end float (in.)	0.002-0.004	0.002-0.004
big-end side clearance (in.)	0.008-0.012	0.0058-0.0093
Camshaft end float (in.)	0.003-0.005	0.003-0.004
Gudgeon pin dia. (in.)	0.9447-0.9450	0.9447-0.9450
Ring gap, fitted (in.)	0.010-0.014	0.010-0.014
Ring clearance in groove (in.)	0.002-0.004	0.002-0.004

ENGINE SPECIFICATION—(continued)

<i>Super Snipe and Pullman (S.V. engine)</i>	<i>Super Snipe and Pullman Mk. IV (O.H.V. engine)</i>	<i>New Super Snipe Series I to III</i>
85	88.9	82.55 (Series I)
120	111.13	87.3 (Series II and III)
4,086	4,139	82.55
6.25:1	6.48:1 or 7.13:1	2,651 (Series I)
		2,951 (Series II and III)
		7.5:1 or 8:1
112-117	116-124 or 136-144	155-165 or 170-175
100/3,400	113/3,400 or 116/3,600	118/5,000 or 123/4,900 (Series I)
197.5/1,200	206.5/1,400 or 210/1,400	124/5,000 or 129/4,900 (Series II and III)
1,5,3,6,2,4	1,5,3,6,2,4	138.3/1,600-2,400 (Series I)
9°	15°	161.8/1800 (Series II and III)
0.014	0.018	1,5,3,6,2,4
0.010 (cold)	0.010-0.012 (cold)	20°
		0.019
45°	45°	0.014 (hot)
0.3518-0.3524	0.3728-0.3735	45°
0.3505-0.3510	0.3728-0.3735	0.3417-0.3422
0.0014-0.003	0.0015-0.0032	0.3407-0.3412
0.0028-0.0043	0.0015-0.0032	0.001-0.003
To project $\frac{11}{16}$ into tappet chamber	0.70 above spring seat	0.002-0.004
To project $\frac{11}{16}$ into tappet chamber	0.70 above spring seat	0.61 above cylinder head
1.661-1.665	1.741-1.745	0.65 above cylinder head
1.386-1.390	1.511-1.515	1.546-1.550
2.5580-2.5585	2.7495-2.7500	1.332-1.336
0.0005-0.0025	0.0015-0.003	2.4990-2.4995
2.1244-2.1252	2.2490-2.2495	0.0007-0.0025
0.0005-0.0023	0.0005-0.002	2.0005-2.001
0.002-0.004	0.004-0.006	0.0005-0.002
0.0058-0.0093	0.008-0.012	0.002-0.004
0.003-0.005	0.003-0.005	0.008-0.012
0.9447-0.9450	1.1248-1.1250	0.003-0.005
0.010-0.016	0.010-0.015	0.9375-0.9378
0.002-0.004	0.002-0.004	0.009-0.014
		0.002-0.0035

ENGINE SPECIFICATION—(continued)

<i>Torque-wrench Load (lb.-ft)</i>	<i>Cylinder Head</i>	<i>Main Bearings</i>	<i>Big-end Nuts/Bolts</i>
Hawk (S.V.)	54 (cold)	45-65 30-40 (rear)	30-40 (steel rods) 24-34 (alloy rods)*
Hawk (O.H.V.)	58 (hot)	45-65 30-40 (rear)	27-30 (alloy rods)†
Snipe, Super Snipe, Pullman (S.V.)	42 (cold)	45-65	30-45
Super Snipe and Pullman Mk. IV (O.H.V.)	58 (hot)	80	60-65
Super Snipe Series I-III (O.H.V.)	60-65 (hot)‡ 65-70 (hot)§	70-75	35-37

* With castellated nuts. † With nyloc nuts. ‡ Series I and II. § Series III.

should be inserted through the driven-plate splines and into the spigot before tightening the clutch cover to flywheel bolts.

The unit can now be fitted to the chassis, and the services of at least two people will be required, one to lower the engine and the other to guide it clear of all obstacles and to locate it on the gearbox. This latter operation is important and, to avoid damage to the clutch, the engine must be entered squarely and centrally into the gearbox bellhousing and the use of force must be avoided. The gearbox may have to be shifted on its locating jack to make it assume the correct angle for entry of the primary shaft into the clutch.

As soon as the hub of the clutch driven plate has entered on to the primary shaft, it will be possible to slide the engine towards the bellhousing for a short distance, when resistance will then be felt. It is now necessary to line up the clutch and primary-shaft splines by rotating one or the other. It is usually easiest to place the gearbox in gear, with one rear wheel jacked up, and turn the wheel slightly in either direction to achieve alignment. If light pressure is applied to the engine unit in a rearward direction, the unit should pass on to the gearbox splines and complete this operation.

Fit a few of the bellhousing bolts and tighten evenly, ensuring that the faces come together without forcing. The engine can now be lowered on to its mountings and assembly may be completed in the reverse order of dismantling. Before attempting to start the engine, ensure that nothing, e.g. fan blades, will foul.

Adjust engine tie rods, where fitted, in such a way that they steady the unit without being pre-loaded in either direction.

CHAPTER V

COOLING SYSTEM

THE cooling water is circulated by an impeller-type pump which is mounted on the front of the engine, together with a fan, and driven by a "V" belt from the pulley at the front end of the crankshaft.

On side-valve engines, water is drawn from the bottom tank of the radiator, through the bottom hose, and discharged into the cylinder block through a water distributor tube, mounted within the jacketing of the engine. This tube directs water, by means of jets drilled in its side, towards the exhaust-valve seatings, and is fitted on all engines except early Hawk, up to Mk. III, where water passes directly into the cylinder block.

The water passes upwards to the cylinder head through water-ways and circulates around the combustion-chamber jacketing before entering the radiator top tank via the top water pipe. The heated water passes through finned water tubes to the bottom tank, where it continues the cycle of operations.

On overhead-valve engines, water passes from the pump to the cylinder head, which contains the distribution tube, and to the cylinder block through water-ways and, after circulating, enters the radiator top tank.

The cooling system is not required to come into full operation until the engine has reached its normal working temperature. This temperature should be attained as quickly as possible after starting from cold, and for this purpose a thermostat is incorporated in the system. This unit, housed in the top water-pipe casting on the cylinder head on side-valve engines, and in a housing on top of the water pump on overhead-valve engines, is a valve which is closed while the engine is cold and does not start to open until water within the engine-cooling jackets has reached a temperature of 167° F. (side-valve engines) and 173° F. (overhead-valve engines).

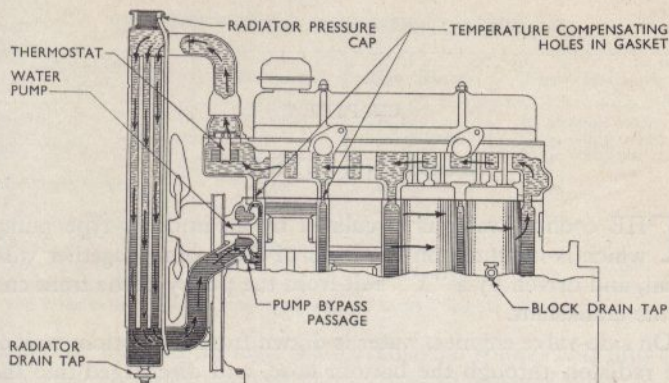


FIG. 1.—SECTION THROUGH WATER-COOLING SYSTEM SHOWING THERMOSTAT IN CYLINDER HEAD.

Circulation is maintained, while the thermostat is closed, through a by-pass passage connecting the engine side of the valve to the water pump. The radiator is thus cut out of the system until the water reaches normal running temperature.

Due to the operation of the thermostat just described, it is essential that anti-freeze solution is used in the cooling system in very cold weather, otherwise the radiator will freeze before circulation can take place.

Radiator Relief Valve

A relief valve is incorporated in the overflow pipe on early models and in the radiator cap on later cars. This prevents water from escaping from the overflow pipe when agitated by circulation. In addition, it allows a small pressure build-up within the radiator and raises the boiling point of the water a few degrees.

This is of particular value in conditions of high altitude, tropical temperatures and hard driving, as some additional protection is afforded.

When fitted in the radiator cap, the valve requires no attention. When fitted in the overflow pipe, as on earlier cars, it is removable and can be cleaned or renewed, if leaking or corroded, after the screw cap is removed.

Water Pump

Hawk Mk. I to III and Super Snipe, Snipe and Pullman Mk. I to IV have water pumps which need periodical lubrication. This is described in Chapter II. Pumps on all later engines use a pre-packed spindle-bearing assembly and require no maintenance.

Removing and Refitting Water Pump

As water-pump repairs require the use of specialised equipment, and as exchange-replacement pumps are normally available, the overhaul of these units is not covered in these pages, although general information on removal and refitting is included.

Side-valve Engines.—Drain radiator and cylinder block. Remove or disconnect water hoses. Slacken dynamo adjustment and remove the belt. Remove the four bolts securing fan blades and pulley to the pump-spindle flange; remove blades and pulley. Remove the bolts and washers securing the pump to the cylinder block and lift out pump.

Reverse this procedure for refitting. Fit a new joint between pump face and engine after seeing that faces are clean, and treat both faces with jointing compound, also any bolts which pass into the engine water-ways.

Overhead-valve Engines.—On early engines, the water pump is attached to the cylinder head. Hawk Mk. VI models have an integral pump assembly, which is removed complete after disconnecting the thermometer element, fan belt, pulley and blades, and removing the fixing bolts to the cylinder head. On Hawk Series I and Ia, the pump is mounted on the timing cover and connected to the cylinder head. The radiator must be removed for access to the water pump.

Super Snipe and Pullman Mk. IV models have an impeller and bearing-housing assembly which is detachable from the water-pump housing, and it is normally necessary only to remove the bearing-housing assembly for servicing or replacement.

The new Super Snipe Series I and II cars have the pump bolted to its housing which is incorporated in the top of the front timing cover. The housing is ducted so that water is fed into the cylinder block along a gallery, whence it passes to the cylinder

head through holes cast into the cylinder block and head. To remove the water pump the radiator must first be removed. The operation is otherwise straightforward.

Thermostat

Summer and Winter thermostats were used on all side-valve engines, the latter being fitted when a heater was installed. The temperature at which a thermostat opens is normally marked on the body of the unit, and replacements should be fitted to correspond with this marking. Overhead-valve engines use a thermostat suitable for all conditions, i.e. of one temperature opening, also marked on the unit.

These units are easily removed after draining the radiator, disconnecting water hoses and lifting off the thermostat housing after removal of the bolts. Location on side-valve engines is on top of the cylinder head, and on overhead-valve engines on top of the water-pump housing. A dowel screw secures the thermostat to the housing on Snipe, Super Snipe and Pullman Mk. I to IV inclusive.

Testing Thermostat Operation

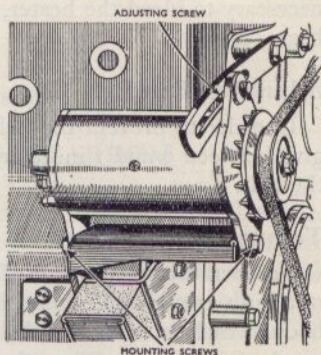
Remove thermostat unit and suspend in a vessel of water. Heat the water slowly and note the temperature with a reliable thermometer. Watch the thermostat carefully and note the temperature at which the valve opens. This should correspond to the temperature marked on the side, and the valve should be fully open 25° to 30° F. After opening commences. Replace with a new unit if inaccurate or valve is sticking open.

Water-distributor Tube

Fitted to Hawk engines from Mk. IV and Super Snipe and Pullman from Mk. II, this tube is provided in order to direct the coolant towards the exhaust-valve seats, to obviate overheating and distortion. It is not fitted in the new Super Snipe engines, as the provision of special cooling holes in the water-ways of cylinder block and cylinder head renders its use unnecessary.

The distributor tube is fitted in the cylinder block on side-valve engines and in the head on overhead-valve units, except the

FIG. 2.—GENERATOR MOUNTING AND FAN-BELT ADJUSTMENT.



new Super Snipe. It should be removed for cleaning during a major engine overhaul, and is accessible after removal of the water pump and cover plate (overhead-valve engines). It may also be necessary to remove the cylinder-block rear-core plug (side-valve engines) or cylinder-head rear-cover plate (o.h.v. engines) and drive out the tube with a piece of hardwood. It is seldom necessary to remove the tube with the engine in position.

Draining, Flushing and Refilling System

This should be carried out at least once a year and is advisable after the winter, especially if anti-freeze solutions have been used. Drain taps are provided for the radiator, usually located near the bottom pipe, and for the cylinder block. On early Super Snipe Mk. IV engines and some Pullman Mk. IV, the water pump has a separate drain tap, located behind and below the generator pulley.

The system should be flushed until clear water emerges from the taps or tap apertures, if blocked taps have to be removed. Make sure that the taps are turned off and free from leaks when refilling.

It is important to warm up the engine and feel that the top of the radiator is warm, before assuming that the cooling system is full. The thermostat must open to allow water to circulate fully and eliminate air locks and, before the job is completed it will be

necessary to bleed the heater, by momentarily disconnecting one heater hose.

Adjusting Fan Belt

In order to prevent the belt slipping, it should be adjusted to give between $\frac{5}{8}$ and 1 in. lateral movement of the longest span of the belt.

Temperature Gauges

Temperature gauges are of two types. One assembly consists of a bulb or element housed in the cylinder head or water-pump body, which is connected by a capillary tube to the instrument on the facia panel. The other type is electrically operated, and comprises a transmitter or element in the water-pump body, connected by a lead to the facia instrument.

The former type must be treated as a unit and will be damaged if separated, while the latter is simpler to remove by disconnecting the wire to the gauge or element, whichever has to be removed.

It is not possible to service either type, and in the case of the earlier, or true thermometer, the complete assembly must be exchanged for a new one.

If the instrument has to be removed in either case, disconnect the battery, drain the water and take out the early type complete, taking care not to damage the capillary tube. Disconnect the wires to the electrical type and remove the instrument by itself.

CHAPTER VI

CLUTCH AND GEARBOX

THE clutch unit is accessible for repair or renewal after removing the gearbox and bellhousing. These units are withdrawn from under the car when placed, for preference, over a pit, although this operation can be carried out if the front wheels are supported on thick wooden blocks or special wheel stands. The engine must be supported under the rear of the sump by a suitable jack and block of wood, to enable the rear of the engine to be lowered sufficiently for the gearbox and bellhousing to be removed. The floor centre section or cover panel must also be removed.

The engine and gearbox assembly is supported at the rear end on rubber mountings located on a bracket attached to the rear of the gearbox. In most cases, the gearbox crossmember is removed with the unit.

CLUTCH

A single dry-plate clutch is used on all models, the flywheel face forming one driving member, the clutch-cover assembly, containing the pressure plate, forming the other driving member.

The clutch-cover assembly is bolted to the flywheel and the driven plate is held under spring pressure between the pressure plate and flywheel. The pressure plate is released through the medium of the clutch pedal, withdrawal linkage, clutch-release bearing and the clutch toggles, which move the pressure plate away from the driven plate when the clutch pedal is depressed.

Mechanical-withdrawal linkage is employed on Hawk Mk. I to VI models inclusive and on all 6-cylinder cars up to and including Super Snipe and Pullman Mk. IV.

Hydraulic withdrawal mechanism is used on the Hawk Series I to II and on the Super Snipe Series I to III. This system

incorporates a hydraulic master cylinder and slave cylinder, operating on the same principle as for hydraulic brake actuation.

Clutch-pedal Adjustment

Due to the inevitable slight wear with normal use at the clutch disc, the release fingers, or toggles, tend to move closer to the release bearing and, unless adjusted, all clutch-pedal free travel may be taken up. If this occurs, the release bearing will be rubbed by the release plate attached to the clutch fingers, spring pressure will be partially reduced and the clutch will begin to slip, thus causing rapid wear of the driven-plate linings.

Pedal adjustment is therefore provided, and although the linkage differs in the various models, the principle is the same, and several methods of adjustment are shown in the illustrations, which cover the mechanical and hydraulic-withdrawal systems.

The clutch pedal free travel is the clearance which should exist between the pedal in its normal rearmost position and when moved forward sufficiently to bring the release bearing into contact with the release plate. This is easily felt by hand with mechanical linkage and the free movement should be about 1 in.

When hydraulic withdrawal is used, as on the latest cars, the free travel cannot be easily felt on the pedal itself, and adjustment

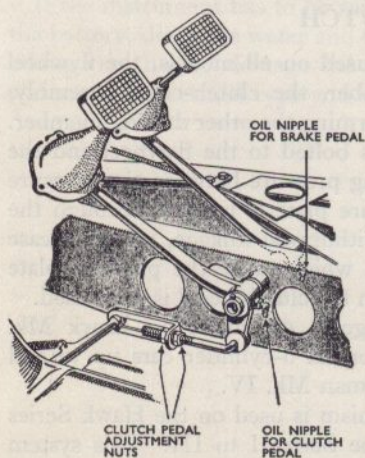


FIG. 1.—CLUTCH-PEDAL ADJUSTMENT ON HAWK Mk. III-V AND SUPER SNIPE Mk. IV.

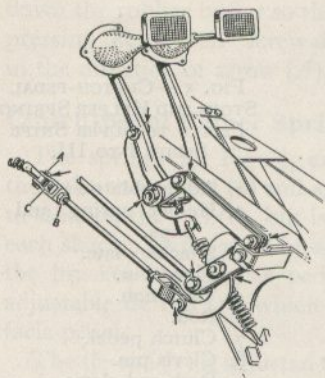


FIG. 2.—CLUTCH-PEDAL ADJUSTMENT ON EARLY Mk. VI HAWK.

A. Clevis pin. B. Locknut.
C. Yoke.

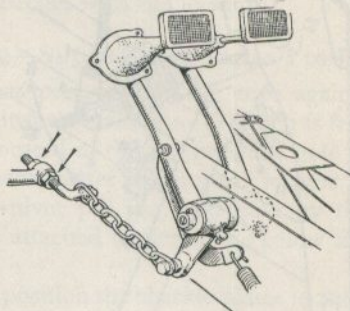


FIG. 3.—CLUTCH-PEDAL ADJUSTMENT ON LATER Mk. VI HAWK.

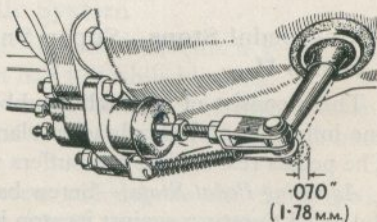
A similar arrangement is used on Snipe Mk. I and Super Snipe and Pullman Mk. I-III.

is therefore checked on the clutch-withdrawal lever itself, and movement on the outer end of this lever should be in the order of $\frac{1}{16}$ to $\frac{3}{32}$ in. before the release bearing actually commences to disengage the clutch.

To Adjust Pedal Clearance (Mechanical Linkage).—Slacken the locknuts on the link adjacent to the end of the withdrawal lever and adjust until 1 in. free travel is obtained (see illustrations).

To Adjust Withdrawal-lever Clearance (Hydraulic Linkage).—No adjustment between pedal and master cylinder is necessary,

FIG. 4.—CLUTCH WITHDRAWAL-LEVER ADJUSTMENT ON HAWK SERIES I, Ia AND II.



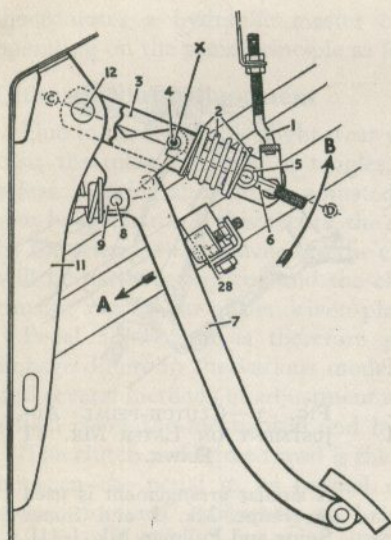


FIG. 5.—CLUTCH-PEDAL STOPS AND HELPER SPRING FITTED TO SUPER SNIPE SERIES I TO III.

1. Adjustable tie rod.
2. Helper spring and cups.
3. Shackle plate.
4. Fixed pin.
5. Trunnion.
6. Rod.
7. Clutch pedal.
8. Clevis pin.
9. Push-rod clevis.
11. Bracket.
12. Pivot pin.
28. Rubber buffers.

this being set in manufacture. Clearance between the slave-cylinder push rod and the end of the withdrawal lever must be adjusted by shortening or lengthening the push rod on Hawk Series I and Ia (Lockheed system) to provide a clearance of $\frac{1}{16}$ to $\frac{1}{32}$ in.

On Super Snipe Series I to III and Hawk Series II with Girling system, the slave-cylinder clearance is automatically adjusted as wear takes place. On these models, however, a pedal stop of the rubber-buffer type must be set as described below. A clutch-pedal helper spring is also incorporated on Super Snipes.

Clutch-pedal Stops—Super Snipe Series I to III, Hawk Series II

These consist of adjustable rubber buffers (28), Fig. 5, fitted one into each end of a bracket clamped to the steering column. The pedals rest against the buffers when released.

Adjusting Pedal Stops.—Screw back the rubber buffer to allow the pedal to return against its stop in the master cylinder. Screw

down the rubber buffer so that it touches the pedal without compressing the rubber. Screw down the buffer three complete turns in the direction of arrow (*A*). Secure with the locknut.

Clutch-pedal Helper Spring—Super Snipe Series I to III

The spring (2), Fig. 5, exerts pressure via the cups against the yoke end of rod (6) and against the trunnion (5) which is free to slide on the rod (6), but is located in the intermediate hole in each shackle plate (3). The shackle plates are, in turn, located in the bracket (11) by the pedal-pivot pin (12) and held by the adjustable tie rod (1), which is attached to the flange below the facia panel.

The tie-rod (1) is adjusted to position the shackle plates in such a way that a line (*CD*) drawn through the centres of the shackle holes in slightly below the centre of the fixed pin (4) on the pedal lug. The spring then bears on the yoke and fixed pin in the pedal lug, to hold the pedal against the rubber buffer when not in use.

On depressing the pedal to disengage the clutch, the fixed pin (4) is moved below the axis of the shackle-plate holes, allowing the spring to assist the pedal in its downward movement.

Adjusting Pedal-helper Spring.—Adjust the inclination of the shackles (3) by means of the two locknuts at the mounting of the tie rod (1) to the flange below the facia panel as follows:

Adjust in direction of arrow (*B*) until a point is reached at which the pedal, when depressed, fails to return fully to the rubber stop. Adjust in the reverse direction by the *minimum* amount necessary to allow full return of pedal. Tighten the locknuts. Note that the pedal stop must be adjusted before the helper spring.

Bleeding Clutch Hydraulic System

(1) Top up the container—nearest the clutch pedal—with clean fluid and keep it at least half full while bleeding.

(2) Attach a rubber tube to the bleeder screw on the slave cylinder, allowing the free end to be submerged in a little brake fluid in a clean glass jar.

(3) Slacken the bleeder screw and depress the clutch pedal slowly (two people required); tighten the screw before the pedal

reaches the end of its stroke and allow the pedal to return to the top of its stroke (Hawk), or return the pedal by hand (Super Snipe).

(4) Repeat operation 3 until bubbles cease to appear from the end of the tube in the jar.

(5) Top up the container and test the clutch operation.

Clutch Troubles

The following conditions can affect clutch operation, and are described briefly so that the owner can diagnose them.

(a) *Clutch does not Release Fully*.—When the clutch pedal is fully depressed there is difficulty in engaging bottom gear because the gears do not stop rotating. The usual cause is excessive clutch-pedal free movement, or the carpet or floor board is preventing full pedal travel.

With hydraulic actuation, the system may also need bleeding as just described, due to air reducing the effective full movement of the release mechanism.

(b) *Clutch Slip*.—This condition is denoted by engine speed increasing on acceleration without corresponding increase in road speed. This is due either to absence of clutch-pedal free movement or to the presence of oil on the driven-plate linings. The former is the more likely and adjustment should be made at once.

If insufficient adjustment is left to provide free-pedal movement or if the clutch still slips, the unit will have to be removed for attention.

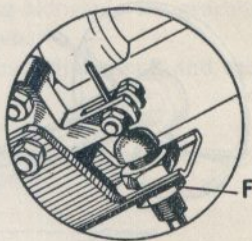
(c) *Clutch Engagement is Harsh or "Shudders"*.—With mechanical linkage this can be caused by the engine tie rod being out of adjustment, or the rubbers worn. Renew rubbers if required and adjust the tie rod to support the engine axially without strain.

Ensure that the rear-engine rubber mountings are sound and that the rear-spring "U" bolts are tightened.

If shudder persists, especially on cars with hydraulic clutch actuation, the clutch unit will have to be removed and inspected. It is essential that the driven plate is in good condition in regard to linings and cushion springs and that the toggles of the clutch-cover assembly are set to the correct and same height. Equipment for doing this is carried by Rootes Dealers.

FIG. 6.—GEARSHIFT LINKAGE
ADJUSTMENT ON HAWK Mk.
II-VI.

Showing steering-column end
of conduit. F. Conduit re-
taining nut.



GEARBOX

Gearshift Linkage Adjustment (Column Change)

Hawk Mk. II to VI.—Adjust the selector cable only. Do not adjust the rod linkage (gearshift).

- (1) Place the gear lever in *first* gear and wedge it in this position.
- (2) Using two spanners slacken the nut clamping the inner cable to the selector lever at the bottom of the steering column.
- (3) Using pliers, pull the inner cable upwards as far as it will go and make a pencil mark on the cable.
- (4) Push the cable down as far as it will go and mark the cable again.
- (5) Pull the inner cable upwards again and, using two spanners, tighten the clamping nut when the cable is positioned midway between the two marks.
- (6) Remove the wedge and check gearshift operation. If the floor centre section is removed, this adjustment may be more conveniently carried out at the gearbox end.

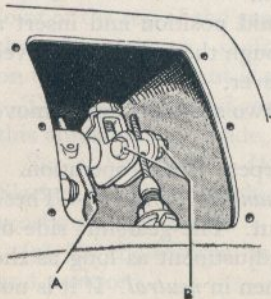


FIG. 7.—GEARSHIFT LINK-
AGE ADJUSTMENT (THROUGH
FLOOR TUNNEL) ON HAWK
SERIES I AND Ia.

A. $\frac{3}{16}$ in. rod.
B. Adjustment nuts (use
two spanners.)

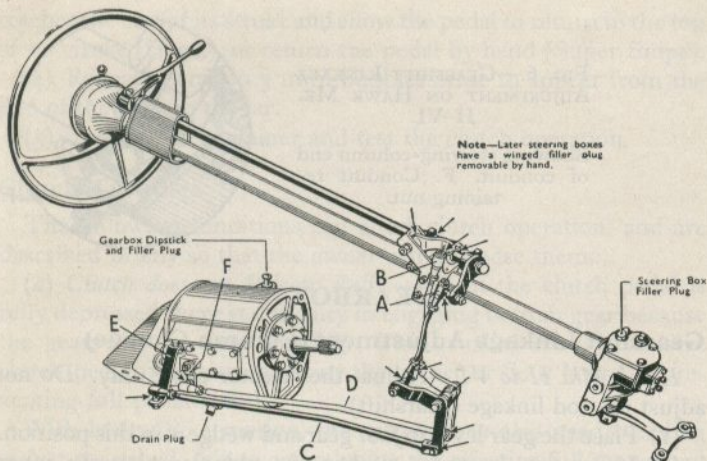


FIG. 8.—GEARSHIFT LINKAGE ADJUSTMENT ON SUPER SNIPE Mk. II AND III AND PULLMAN Mk. II-IV.

The small arrows indicate lubrication points.

- | | |
|--------------------------|-----------------------------|
| A. Shaft link. | D. Gear-selector relay rod. |
| B. Selector link. | E. Gear-shift lever. |
| C. Gear-shift relay rod. | F. Gear-selector lever. |

New Hawk Series I to II.—(1) Remove centre floor carpet and front inspection plate in floor tunnel.

(2) With the gearbox in *neutral*, wedge it downwards against the 1st- and 2nd-speed stop.

(3) Using two spanners, slacken the nut clamping the inner cable to the selector lever on the gearbox.

(4) Move the selector lever to the mid position and insert a piece of $\frac{3}{16}$ in. rod, or a long screw, through the hole in the cover boss and in the spindle of the selector lever.

(5) Tighten the clamping nut, using two spanners and remove the rod or screw.

(6) Refit the floor-cover plate and carpet. Check operation.

Super Snipe Mk. II and III and Pullman Mk. II to IV.—These models employ a rod linkage throughout. The gearshift side of the linkage will not normally require adjustment as long as the gear lever is at the 3 o'clock position when in *neutral*. If it is not

in this position, the gearshift rod running alongside the gearbox must be lengthened or shortened as shown.

The gear-selection rod is the one needing adjustment, and this is carried out as follows:

- (1) Keep the gear lever in *neutral*.
- (2) Find the mid-point of traverse of the gearbox selector lever (*F*), Fig. 8.

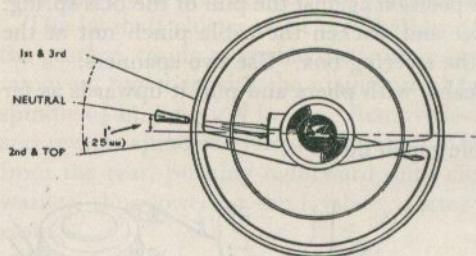


FIG. 9.—CORRECT NEUTRAL POSITION OF GEARSHIFT LEVER ON SUPER SNIPE MK. IV.

- (3) Hold the hand lever against the lower stop in the 1st-and 2nd-gear position and wedge it.

- (4) Adjust and couple up the selector link (*D*) with the selector lever (*F*) at the mid-point of its traverse.

The selector linkage will now be in correct adjustment.

Super Snipe Mk. IV—Adjustment of Gear-lever Position.—The tip of the gear-lever handle, when in the neutral position, must be positioned 1 in. above the horizontal line (see Fig. 9), to avoid the lever fouling the upper and lower steering-column covers when the gears are engaged.

Adjustment should be carried out by disconnecting the ball joint at the top of the gearshift rod from the lever at lower end of the column-control shaft and lengthening or shortening the rod on to which ball joint is screwed.

The hand lever and gearbox shift lever must be in neutral when this adjustment is made.

Super Snipe Mk. IV—Adjustment of Selector Cable.—(1) Slacken the cable pinch nut at the external selector lever on the gearbox (short lever).

- (2) Set the external selector lever in its mid-position (1st and 2nd position).

(3) Place the steering-column gear lever in 2nd gear and wedge it there.

(4) Move the gearbox external-selector lever towards the cable as far as it will go (to take up all the play) and re-tighten the cable pinch nut, using two spanners.

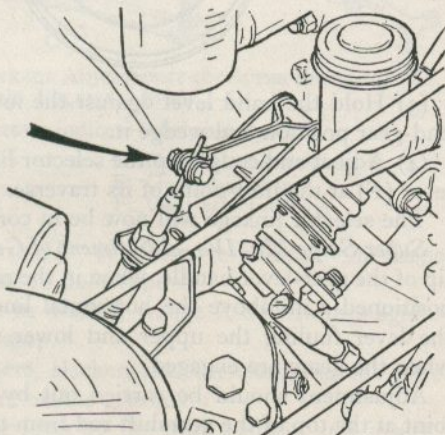
New Super Snipe Series I to III.—(1) See that the hand lever is in neutral and in the 1st reverse line, nearest to the steering wheel. Keep it in this position against the pull of the bias spring.

(2) Open the bonnet and slacken the cable pinch nut at the end of the lever near the steering box. Use two spanners.

(3) Grip the inner cable with pliers and pull it upwards as far as it will go.

(4) Tighten the cable pinch nut.

FIG. 10.—GEARSHIFT
LINKAGE ADJUSTMENT
ON SUPER SNIPE SERIES
I AND II.



Dismantling Gearbox—Hawk Mk. III to VI

Remove dipstick and main cover. Prevent rotation of mainshaft by engaging two gears. Remove driver coupling, distance sleeve and seal. Return selector forks to neutral. Remove cover and rear-support plate. Remove speedometer driving wheel and distance piece from mainshaft.

Make up three dummy selector shafts by cutting off three 2-in. lengths of $\frac{7}{16}$ -in. diameter bar, to retain the balls, springs and

shims in position in the selector forks as the selector shafts are driven out towards the *rear* of the gearbox. Drive out the reverse-selector shaft. Note the distance piece at the rear of the selector fork. Drive out the 1st- and 2nd-speed (central) selector shaft rearwards in a similar manner. Now drive out the 3rd- and top-selector shaft. Note the positions from which the shafts are removed to facilitate correct replacement. Remove the reverse, 1st-, 2nd-, 3rd- and 4th-selector forks in this order.

The layshaft cluster must now be lowered into the bottom of the gearbox casing to enable the front cover and stemwheel to be removed, together with the mainshaft. Make a dummy layshaft spindle $6\frac{1}{2}$ in. long $\times$ $\frac{3}{4}$ in. dia. Remove locking plate for layshaft and reverse spindles. Displace layshaft by entering dummy shaft from the rear, pushing it forward until clear of the fixed thrust washer, thus lowering the layshaft cluster to the bottom of the casing.

Remove the four setscrews securing the front cover to the casing and withdraw the front cover and stemwheel assembly. Remove the two spigot bushes from the mainshaft (27 needle rollers, later Hawk Mk. VI). Remove the 4th-speed baulking ring from the synchro hub. During subsequent dismantling each of the three baulking rings should be kept with its own gear and identified by means of a scribe.

Support the mainshaft at its forward end and, with the aid of a mallet, drive the assembly forward until free of the rear bearing. Hold the 2nd-speed synchro-hub assembly by hand and withdraw from it the mainshaft assembly through the aperture in the front of the casing. Lift out the 2nd-speed synchro-hub assembly and wheel through the aperture in the top of the casing. The 3rd- and top-speed hub and sliding sleeve have yet to be removed from the mainshaft. This operation is detailed under "Dismantling Component Parts and Checking".

Extract the layshaft assembly complete with rollers, abutment ring and floating steel thrust washer through the aperture in the front of the casing. Remove the two bronze thrust washers from the casing. These are equipped with locating tabs, which engage with slots in the casing to prevent rotation.

Remove the reverse-idler wheel by withdrawing its spindle

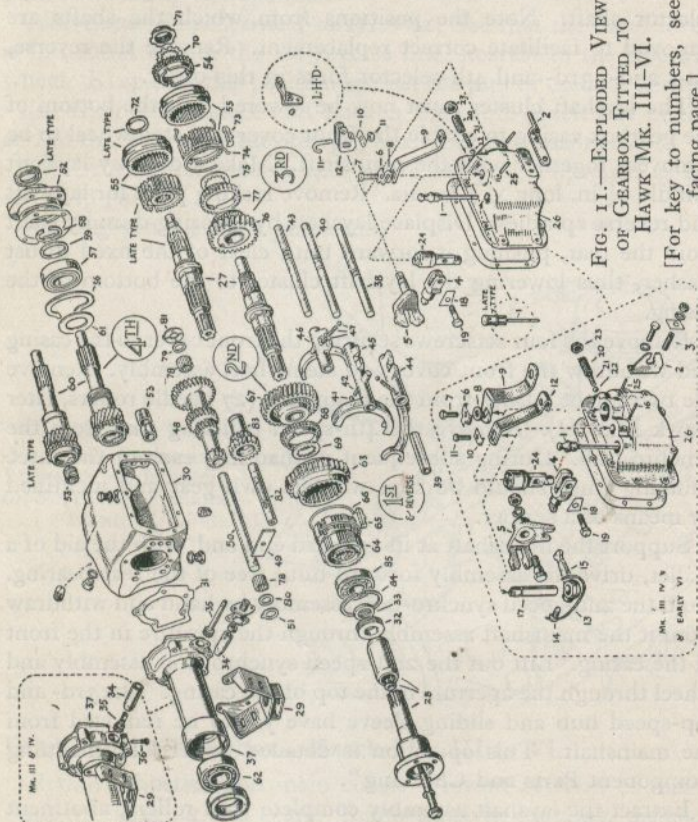


FIG. 11.—EXPLODED VIEW
OF GEARBOX FITTED TO
HAWK Mk. III-VI.

[For key to numbers, see
facing page.]

KEY TO FIG. 11

- | | |
|---|-----------------------------------|
| 1. Oil-level dipstick. | 43. 3rd and 4th-selector shaft. |
| 2. Cable-abutment bracket. | 44. Reverse selector fork. |
| 3. Grub screw. | 45. 1st and 2nd selector fork. |
| 4. Internal change-speed lever. | 46. 3rd and 4th selector fork. |
| 5. Selector safety latch. | 47. Ball, spring and shims. |
| 6. Lockwasher. | 48. Layshaft cluster. |
| 7. Bolt. | 49. Lockplate. |
| 8. Washer. | 50. Layshaft. |
| 9. External gear-shaft lever. | 51. Thrust washer. |
| 10. Lockwasher. | 52. Front cover. |
| 11. Bolt. | 53. Spigot bushes. |
| 12. External selector lever. | 54. 4th-speed baulking ring. |
| 13. Wire. | 55. Synchrohub. |
| 14. Setscrew. | 56. Circlip. |
| 15. Internal selector lever. | 57. Bearing. |
| 16. Locating pin. | 58. Circlip. |
| 17. Selector-lever shaft. | 59. Abutment washer. |
| 18. Lockwasher. | 60. Stemwheel. |
| 19. Setscrew. | 61. Bearing shield. |
| 20-23. Detent mechanism comprising screwed thimble, spring, ball and nut. | 62. Bearing. |
| 24. Change-speed lever shaft. | 63. 1st-speed wheel. |
| 25. Locating pin. | 64. Hub. |
| 26. Main-cover assembly. | 65. Shifting plates (long). |
| 27. Mainshaft. | 66. Synchro circlip. |
| 28. Driver coupling. | 67. 2nd-speed wheel. |
| 29. Rear-support plate. | 68. 2nd-speed baulking ring. |
| 30. Case. | 69. 2nd-speed thrust washer. |
| 31. Paper joint. | 70. Mainshaft-nut locking washer. |
| 32. Speedometer driving wheel. | 71. Mainshaft locknut. |
| 33. Distance piece. | 72. Circlip. |
| 34. Pinion bearing. | 73. Shifting plates (short). |
| 35. Pinion. | 74. Synchro circlips. |
| 36. Securing pin. | 75. 3rd-speed thrust washer. |
| 37. Rear cover. | 76. 3rd-speed wheel. |
| 38. Reverse selector shaft. | 77. Baulking ring. |
| 39. Distance piece. | 78. Rollers. |
| 40. 1st and 2nd-speed selector shaft. | 79. Abutment ring. |
| 41. Ball. | 80. Floating steel thrust washer. |
| 42. Spring. | 81. Bronze thrust washers. |
| | 82. Reverse-wheel spindle. |
| | 83. Reverse wheel. |
| | 84. Bearing circlip. |
| | 85. Bearing. |

rearwards out of the casing and lifting out the wheel assembly. Carefully drive out the rear bearing, using a soft-metal drift on the inside faces of the outer track of the bearing. Do not drive out bearing by the inner track, as this may damage the balls and

tracks. Do not remove circlip from bearing outer track, otherwise a new one will need to be fitted.

Overhauling Gearbox Components—Hawk Mk. III Onwards

Rear Cover—To Remove Speedometer Pinion and Bearing.—On Mk. III to V (side-valve engine), push the pinion and bearing outwards from the inside, after removing the securing pin (dowel bolt), the head of which faces downwards. Ensure that the location port in the bearing lines up with the securing pin when reassembling.

On Mk. VI and later models (O.H.V.), the pinion and bearing are retained by an outer flange, the inner boss of which is keyed to engage a slot in the bush. Remove two screws and washers to dismantle. Renew the seal when reassembling, as this is protection against oil finding its way up the speedometer cable and may leak if disturbed.

Rear-cover Rear Bearing (Hawk Mk. III to VI) and Oil Seal.—Check that the ball race runs smoothly and is free from excessive play. Renew if necessary. Renew the oil seal if there is any evidence of oil leakage. Use a larger diameter drift and tap the new seal carefully into position against its shoulder in the rear cover.

Third-and Top-selector Shaft and Fork Axial Load.—Carefully grip the selector fork in the vice, insert shims, spring and ball, then the selector shaft, depressing the ball by inserting a punch. Attach a spring balance by hand vice or other suitable means to the selector rod and test the load required to move the shaft groove across the ball in the fork. This load should be 25/30 lb. Add or subtract shims as necessary to achieve this figure.

As it will be necessary to detach the selector shaft from the fork for actual assembly, the dummy shaft must be replaced in the fork after testing.

Front Cover and Stemwheel.—Remove large circlip securing bearing in front cover. Press or drive out stemwheel and bearing from cover. Remove small circlip securing bearing to stemwheel. Remove abutment washer and press bearing off stemwheel. Remove bearing chip shield. Do not omit this on

reassembly. A three spot bearing is used, which allows a small amount of play in the assembly, to ensure freedom of movement when the stemwheel is assembled to the rest of the gearbox components. This play should not be confused with excessive wear of roughness. Renew the bearing if in any doubt.

Dismantling Mainshaft Components.—The 1st-speed wheel with 2nd-speed synchro hub assembly and the 2nd-speed wheel—and thrust washer on Mk. III to early Mk. VI units—have already been removed when the mainshaft was withdrawn.

Secure mainshaft in vice, using soft-metal clamps. Release tab of lockwasher and, with suitable box spanner, undo mainshaft locknut and remove. Remove circlip only on later Hawk Mk. VI boxes, by carefully levering off groove with a fine screwdriver.

Remove 3rd-speed synchro-hub assembly, 3rd-speed thrust washer (early models) and 3rd-speed wheel. Remove baulking ring from 3rd-speed wheel cone.

Remove sliding sleeve from 3rd-and top-synchro hub, remove three short shifting plates and two circlips.

Remove 1st-speed wheel from 1st- and 2nd-synchro hub, three long shifting plates and remove front circlip and rear circlip by pulling gap of circlip over hub-groove diameter. Do not distort clips.

Reassembling Mainshaft Components—3rd- and Top-synchro Hub and Sleeve and 3rd-speed Wheel.—Check the fit of the sleeve on the hub; this should slide freely but should not tilt on the splines. Check that the chamfers at the ends of the sliding-sleeve internal teeth are each flat and free from burrs. Stone if necessary, or replace the part if badly worn or damaged.

Inspect the three short shifting plates to see that they are of identical type—replace the set if worn or damaged—and fit them, pips outwards, into the grooves of the synchro hub. Carefully fit the sliding sleeve. Fit the tang of one circlip into the hollow of one shifting plate and ease the circlip into position in the hub recess. Turn the hub over and repeat the process. The two circlips must be of the same type—either round or square section, and their tangs must not locate in the two ends of any one shifting plate, as this could overload one shifting plate and cause difficult gear movement.

Take the 3rd-speed wheel, ensure that the cone is not scored and lightly smear it with engineer's blue or red lead. Offer the 3rd-speed baulking ring up to the cone, press it into position with the fingers and rotate it. At least 60 per cent of the bore of the ring should be "blued". Replace the ring if distorted.

Fit the 3rd-speed baulking ring to the wheel and fit these to the mainshaft, which should be clamped in the soft jaws of the vice by the rear end. Fit thrust washer (early models), 3rd- and top-hub assembly, new lockwasher and the nut (circlip, late Mk. VI). The 3rd-speed-wheel end float should be 0.004–0.006 in. On units with mainshaft locknut this can be corrected, if excessive, by fitting a new 3rd-speed thrust washer. In boxes with

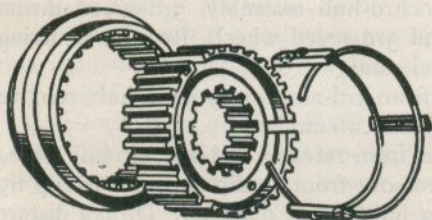


FIG. 12.—ARRANGEMENT OF 3RD AND TOP SPEED SYNCHRO-HUB CIRCLIPS.

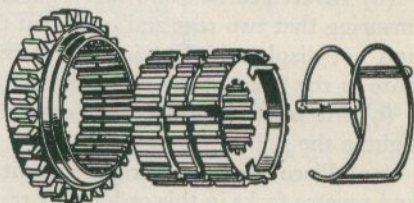
circlip retention of 3rd-speed parts, circlips of three alternative thicknesses are available to adjust end float. Circlips should be used once only and for this reason it is best to break or cut a piece off the original mainshaft circlip, of slightly less than half the circumference, and to check the end float with this piece of circlip temporarily fitted. Using a micrometer, measure the thickness of this trial circlip and select a new circlip to provide the required end float of 0.004–0.006 in.

Reassembling Mainshaft Components—1st- and 2nd-synchro Hub and 1st-speed Wheel.—Ensure that the 1st-speed wheel slides freely on the splines of the hub. There should be minimum play at the forward, or 2nd-speed, end of the hub between the two members, although the assembly is designed to permit a small amount of rotary movement of the 1st-speed wheel on the hub when the wheel is in the 1st-speed or rearward position.

Carefully stretch the rear circlip over the hub and locate it

in its groove. Place one long shifting plate in each of the three slots in the hub and locate the tang of the circlip in one of the plates. Hold the shifting plates in position in their slots and fit the 1st-speed wheel over the hub and plates. Fit the front circlip. Inspection of the remaining parts, i.e. thrust washers, ball races, etc., should now be made and any worn or damaged parts replaced. The unit is then ready for reassembly as detailed hereunder.

FIG. 13.—ARRANGEMENT OF 2ND SPEED SYNCHRO-HUB CIRCLIPS.



Reassembling Gearbox—Hawk Mk. III Onwards

(1) Fit reverse wheel and shaft into casing with the gears facing rearwards.

(2) Position the bronze thrust washers (large one to the front) with the aid of grease in the gearbox casing.

(3) See that there are 27 needle rollers in each end of the layshaft cluster. Locate them with grease.

(4) Fit abutment ring in front of the rollers at the front of the layshaft cluster and lower cluster, complete with dummy shaft, into the casing. Fit rear-floating steel-thrust washer and check end float (0.006–0.008 in.). Adjust if necessary by using an alternative floating thrust washer.

(5) Pass the 1st- and 2nd-synchro hub and 2nd-speed-wheel assembly through the top of the casing with bevelled or rounded edges of 1st-speed teeth to the rear and enter the mainshaft through the front of the casing. Pass the rear end of the mainshaft through the 1st- and 2nd-synchro assembly. Do not forget the 2nd-speed baulking ring (line up its slots with the shifting plates in the hub) and thrust washer (early models) between 2nd-speed wheel and hub.

(6) With the mainshaft protruding through the rear-bearing

aperture in the casing, fit the rear bearing and tap it right home. Hold the 2nd-speed parts during this process and see that the 2nd-speed baulking ring does not become displaced.

(7) Ensure that the 27 needle rollers or primary shaft bushes (early models) are in position in the primary shaft (stem wheel) and fit the front cover and stemwheel, using a new joint with jointing compound. See that the drain hole in the front cover is in the lowest position.

(8) Invert gearbox and insert layshaft spindle from the rear, ensuring that two rear and one front thrust washers are lined up and not displaced. Use jointing compound to seal the spindle bore in the front of the casing before pushing the shaft right in.

(9) Fit layshaft and reverse-spindle lock plate and securely tighten the bolt.

(10) Place gearbox upright and fit 3rd and top, 1st and 2nd and reverse forks in this order. Fit reverse distance piece and tap in reverse selector shaft from the rear—long end of shaft first. Take out displaced dummy shaft. Fit 1st and 2nd and 3rd and top shafts from the rear in a similar manner.

(11) Fit distance collar and speedometer driving wheel to mainshaft. Fit distance sleeve and seal (not Series I to II). Fit rear cover with new joint and outer bearing (where fitted). Engage two gears and fit and tighten driver coupling.

(12) Return gearbox to neutral. Check that shafts are free and that all gears can be selected.

(13) Fit main cover, taking care to position it so that the internal-selector lever moves freely across the slots in the forks.

The gearbox is now ready for refitting to the car, although the splines of the primary shaft should be lightly smeared with white grease before fitting.

Gearboxes Fitted to 6-cylinder Models

Six-cylinder cars have synchromesh on all four forward ratios (3-speed gearbox on Super Snipe Series I to III), and these units seldom need attention. They are, to an extent, more complicated than the Hawk gearbox just described, but can be worked on satisfactorily by the enthusiastic owner if a little care is taken. The Super Snipe and Pullman Mk. II to IV and the new Super

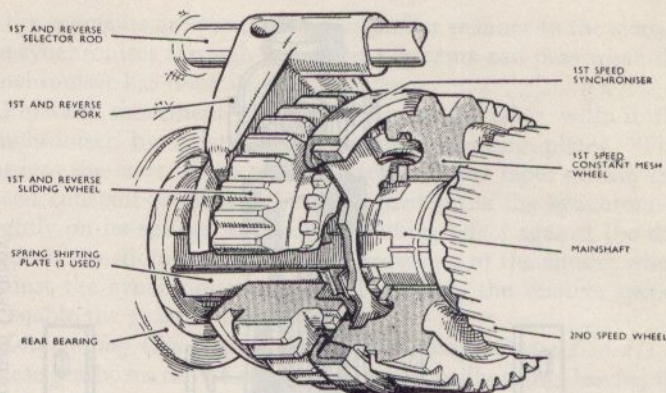


FIG. 14.—CUT-AWAY VIEW OF 1ST-SPEED SYNCHROMESH ON SUPER SNIPE SERIES I AND II.

Snipe Series I to III employ baulking-ring-type synchronmesh as used in Hawk Mk. II onwards.

It should be remembered that these larger gearboxes are of considerable weight and the assistance of two or more persons will be required in removal and refitting.

Super Snipe Series I to III.—The new Series Super Snipes have 3-speed all synchronmesh units, in which the 2nd- and top-synchro mechanism follows the practice already described, in which a baulking ring, actuated by the sliding member through the medium of three shifting plates, prevents the sliding member from engaging the gear until each is rotating at equal speed. Synchronmesh of 1st gear is by means of a ring assembly containing a cone at its forward end which engages a male cone on the 1st-speed constant-mesh wheel. The bore of the ring is splined to the mainshaft and allows a small amount of rotary movement of the cone on the shaft.

The cage of this ring, or synchroniser, is pierced between its splined bore and circumference, by three equidistant slots, the ends of which are chamfered on the side which faces the sliding wheel.

This sliding wheel which engages 1st speed and is also splined to the mainshaft, has dog teeth machined on its forward extremity, which is slotted to divide it into three segments. The edges

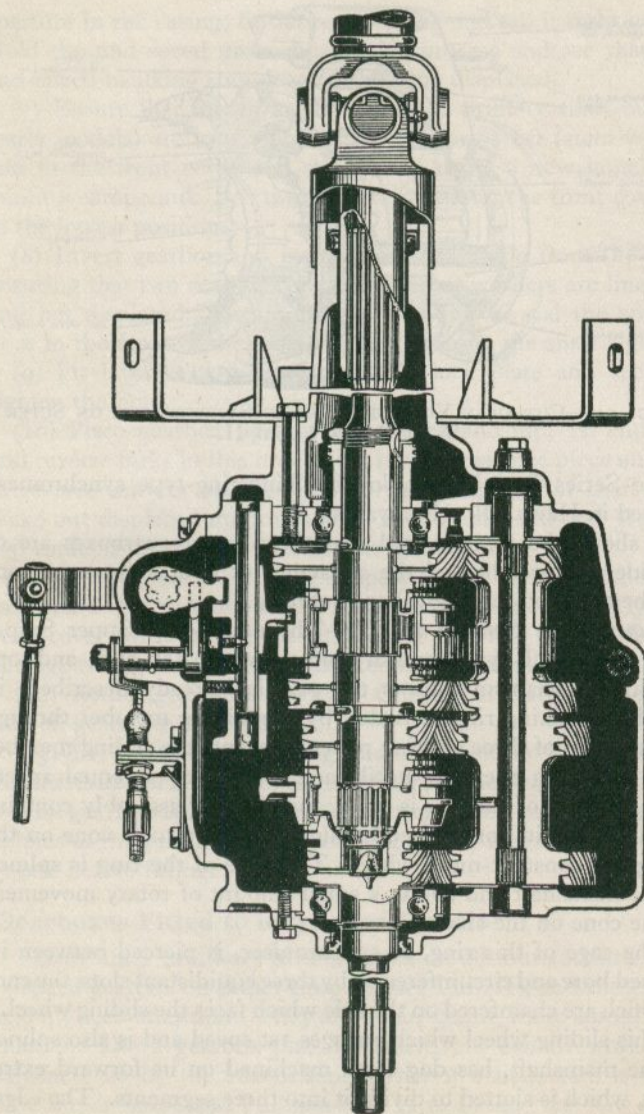


FIG. 15.—SECTION THROUGH 4-SPEED ALL SYNCHROMESH GEARBOX.

of the segments are chamfered in a similar manner to the slots in the synchroniser through which the segments can pass when the synchroniser has done its job.

Forward movement of the sliding wheel takes with it the synchroniser by means of three spring-shifting plates. This engages the cone of the synchroniser with the taper on the 1st-speed constant-mesh wheel, which then turns the synchroniser slightly on its splines to create a baulking effect against the dog teeth of the sliding wheel. Further pressure of the sliding wheel against the synchroniser gradually equalises the relative speeds to enable the gears to engage.

Dismantling Gearbox Fitted to Super Snipe Series I to III.—These gearboxes can be removed from the bellhousing, leaving the latter in position on the engine.

Dismantling procedure is as the "Hawk" unit, and the layshaft cluster must be lowered before removing the primary shaft, after the rear cover, selector rods and forks and layshaft spindle have been removed. The front cover must be removed before the primary shaft is driven forward by means of a soft-metal drift against its bearing. The mainshaft is then driven to the rear to allow the insertion of two strips of metal between the rear-bearing outer track and the casing. The mainshaft is then driven forward off the bearing and the 1st-speed gears removed. The mainshaft with 2nd-speed wheel and 2nd and top hub are then removable through the top of the casing.

Dummy selector shafts are $\frac{7}{16}$ in. diameter and 3 in. and 5 in. long. Dummy layshaft is 0.865 in. diameter $\times$ 7.965 in. long.

Gearboxes Fitted to Early 4-and 6-cylinder Models

Hawk Mk. I (1946-47).—This model has synchromesh of the ball and spring type on the three upper ratios. The inner and outer members of each synchroniser unit are a sliding fit on one another, six spring-loaded balls which register with the annular groove retaining the outer member in the neutral position. If these parts have to be dismantled place a large rag over them whilst separating, to avoid losing the balls which would otherwise spring out.

Reassembly is difficult without special equipment, but a

Jubilee clip can be passed round the hub and tightened to secure the balls and springs, the balls being outwards. Once the latter have been compressed into position, it will be possible to press the hub into the sleeve, the clip sliding along the hub as it is entered. The rest of the working procedure is similar to that of the later Hawk gearbox.

Snipe Mk. I, Super Snipe Mk. I and Pullman Mk. I.—Gearbox has synchromesh on 3rd and top gears only, although 2nd, 3rd and top gears are in constant mesh. The mainshaft has a centre bearing.

This gearbox, like that of the new Super Snipe Series I to III can be removed from the bellhousing, leaving the latter in position on the engine, the rear mounting of which is disconnected and the rear of the engine lowered for gearbox removal.

To dismantle, remove dipstick, top cover and reverse bias-spring assembly (at off side of unit). Engage two gears to lock mainshaft, remove split pin and nut and draw off driver coupling. Remove rear mounting plate and rear cover with oil seal.

Take off speedometer wheel and distance piece. Extract selector springs and packing piece above centre spring, invert gearbox and catch selector balls. Take off bottom cover and undo layshaft front securing nut. Tap layshaft out to the rear with rear caged-roller bearing. Lift out layshaft cluster and rear-floating steel-thrust washer. The 2nd (grooved) thrust washer is pegged to casing.

Remove six front-cover setscrews, release joint by carefully tapping primary shaft forward and lever off front cover with bearing and primary-shaft assembly. Note shims behind front-cover flange for end-float adjustment, catch four thrust balls in spigot bearing which is of caged-roller type.

Take out 3rd- and top-selector-rod setscrew—at nearside—and drive out selector rod to front, using a bent drift, pushing out core plug. Push other two rods as far back as they will go and extract 3rd- and top-selector fork through bottom of box. Lift out 3rd- and top-synchro unit through front, exposing ring nut at front of mainshaft.

Using castellated box spanner, remove ring nut, take out lock-washer and splined thrust washer. Draw out 3rd-speed wheel,

bush and thrust washer. Push 1st gear back and insert a piece of hardwood $\frac{7}{8}$ in. square between 1st and 2nd gears to hold 2nd gear and centre roller bearing in position. Tap mainshaft back about $\frac{1}{4}$ in., exposing 2nd-gear rear thrust washer. Separate thrust washer from projections on bush, pushing bush forward into 2nd gear. Turn thrust washer until it can be slid forward towards bush, clear of the groove in the shaft. With piece of hardwood still in place, drive out mainshaft to the rear with rear ball bearing.

Release both forks from reverse-selector rod, and take out dowel setscrew on off side of box. Extract welch (core) plug, push out rod to rear, and lift out forks. Release 1st- and 2nd-selector forks and push out rod to rear.

Remove setscrew locating reverse spindle and drive spindle out to rear. Lift out reverse wheel. Lift out 1st and 2nd gears, two thrust washers and bush.

Reassembling Gearbox—Snipe Mk. I, Super Snipe Mk. I and Pullman Mk. I.—To reassemble gearbox, reverse the order of dismantling and proceed as follows.

Assemble reverse and 1st- and 2nd-selector rods and forks and reverse rocking lever. Place 1st and 2nd gears in box (1st gear in fork) with thrust washer, with grooves facing second gear, between the gears.

Temporarily assemble mainshaft with bearing (adaptor flange to front), distance piece and a $2\frac{3}{4}$ -in. length of 11 s.w.g., $1\frac{3}{4}$ -in. bore tubing. Tighten driver coupling nut. Feed shaft through gears and thrust washer and drive bearing about $\frac{1}{4}$ in. into box. Slide 2nd-speed thrust washer into groove in shaft and turn so that splines register. Slide 2nd-gear bush on to front end of shaft and push home through gear until projections lock thrust washer. Tap mainshaft forward until thrust washer is just in contact with 2nd gear.

Assemble reverse gear and spindle and lock with setscrew. Remove nut and tubing from mainshaft and assemble distance piece and speedometer wheel. Fit rear cover temporarily with joint and two setscrews.

Assemble 2nd-gear front thrust washer and centre-bearing inner race and rollers, driving race fully home with hollow drift

(9 in. long $\times$ 1½ in. bore), 3rd-gear thrust washer, bush, gear, front washer and lock washer. Tighten ring nut and lock. Assemble 3rd-speed hub and sleeve (long boss to front), selector fork and rod. Insert selector balls and springs, with packing piece over centre spring and clamp temporarily with plate.

Drive mainshaft to rear so that it is fully home. Third- and top-selector fork should have 0.010 in. end float in synchro collar. Assemble small shims and thrust button inside primary shaft with four thrust balls (held in place with vaseline) and caged-roller spigot bearing. Offer up primary shaft and front-cover assembly—without large shims—and tap it on as far as it will go. Test top gear cones for rubbing. When all float towards front of box is absorbed, cones should just rub. To increase rub remove small shims behind primary-shaft thrust balls.

Note clearance, by means of feelers, between front cover and main casing and reassemble with shims to this amount plus 0.010 in., to give correct mainshaft end float. Layshaft end float is 0.008—0.014 in.

CHAPTER VII

REAR AXLE

REAR AXLES of the semi-floating type are used on all models except the Super Snipe Mk. IV, on which a three-quarter floating axle is used.

On semi-floating units, the rear-hub bearings are contained within the extremities of the axle casing, and the hub bearings and axle shafts jointly support the weight of the vehicle. The shafts are removable together with the rear-brake assemblies and must be separated afterwards.

On three-quarter floating units, the rear-hub bearings are located externally on journals at the extremities of the axle casing, and a greater proportion of the weight of the vehicle is supported jointly by the hub bearings and the axle casing, the shaft supporting only a small amount of the weight. The shafts are removable without disturbing the brake gear. Rear-brake drums are easily removable without disturbing the hubs, on all models (for details see Chapter IX).

Spiral-bevel Final Drive

Spiral-bevel final drive is used on 18 h.p. Snipe, Hawk Mk. I and II, Super Snipe Mk. I to III (side-valve engine), Super Snipe Mk. IV Heavy-duty and Ambulance vehicles, and on all Pullmans and Imperials.

The design of the differential unit is basically the same on all these models, in which the pinion housing is detachable from the axle casing and is adjustable axially by means of shims. The crownwheel to pinion lateral adjustment is by means of screwed rings within the bearing saddles of the differential housing, which straddle the differential-carrier bearings.

Hypoid-bevel Final Drive

Hypoid-bevel final drive is used on Hawk models from Mk.

III onwards and Super Snipe from Mk. IV onwards (except heavy-duty vehicles). In this design the centre line of the pinion shaft is below the centre line of the crownwheel.

With all hypoid units crownwheel to pinion adjustment is carried out entirely by means of shims, no screw adjustment being provided. The use of special jigs is recommended when setting up or renewing parts, and dismantling and reassembling will not normally be within the scope of the private owner.

The hypoid units fitted to Hawk and New Super Snipe Series I to III are similar. These use taper-roller bearings and shims for lateral adjustment and pre-load of the carrier bearings, with taper-roller pinion bearings with distance piece and shims for pre-load, and a distance collar, below the pinion head, for axial adjustment.

The Super Snipe Mk. IV hypoid unit differs in having a collapsible sleeve between the pinion bearings which, coupled with a given torque spanner figure for the driven-coupling nut, affords the required pinion-bearing pre-load.

The differential unit can be removed after the shafts are withdrawn.

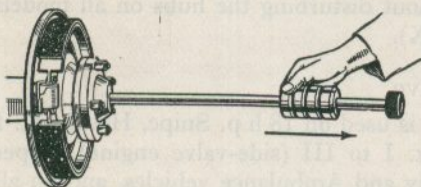


FIG. 1.—REMOVING
AXLE SHAFT USING
TOOL NO. RG. 16.

AXLE SHAFT AND HUB

Removing Semi-floating Axle Shaft

Remove road wheel. Remove countersunk screw or screws and brake drum. Disconnect handbrake-rod fork from lever on backing plate by removing split pin and clevis pin. Note position of washers. Disconnect hydraulic brake pipe at banjo union behind the backing plate. Clean the area around the axle-tube flange and backing plate to avoid the ingress of road dirt to the

hub bearing. Remove nuts and bolts securing brake-backing plate to flange on axle casing.

Ensure that the weight of the car is safely supported on an axle stand below the axle. Temporarily refit the road wheel, grasp the tyre and apply a sharp pull, which will usually ease the hub bearing, with shaft assembly, out of the axle casing. A special tool, which fits over the wheel studs and has a stem with a sliding weight, is more effective in removing the shaft.

Refitting Semi-floating Axle Shaft

All Hawk and New Super Snipe Series I to III.—Ensure that the axle-casing flange and backing plate are clean and that the drain hole in the flange of the axle casing is clear. Position the conical oil deflector within the bearing housing in the axle casing (New Hawk and Super Snipe).

Carefully enter the shaft to avoid the splines damaging the axle-casing oil seal (Hawk Mk. I to VI), line up the grease-catcher duct and grease-retainer drain hole with the drain hole in the axle-casing flange and push the shaft inwards to enter the backing-plate bolts in the casing flange. Tap the shaft right home using a mallet or hammer with a block of wood. Fit the nuts and tighten. Connect up the brake banjo union and handbrake fork, remembering to position the washers within the fork correctly. Refit brake drum, bleed the brakes and replace the road wheel. Refer to Chapter IX (brakes).

Snipe 18 h.p., Super Snipe Mk. I to III and Pullman.—These models employ taper-roller hub bearings and detachable hubs with taper and key. Special care is required in ensuring that hub bearings are correctly adjusted as detailed below.

Before inserting the shaft assembly into the axle casing, inspect the thrust button in the splined end of the shaft and see that it is fully home in the hole provided (one thrust button to each shaft). Ensure that the countersunk holes in the inside face of the bearing retainer line up with the holes in the back plate through which the axle-casing dowels pass.

End float adjustment for the taper-roller bearings is by shims between the end of the axle casing and the back plate. When correctly fitted, with the bearing-inner race hard against the

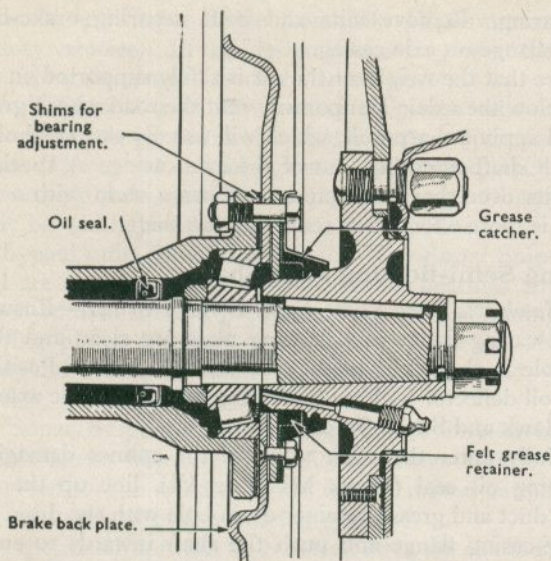


FIG. 2.—SHIM ADJUSTMENT OF REAR-HUB BEARINGS—
SNIPE MK. I, SUPER SNIPE MK I-III AND PULLMAN.

collar shrunk on to the driving shaft, there must be minimum end float; about 0.004 in. is normal.

Shimming of about 0.045 in. is normal with new bearings and it is important that approximately equal shimming is used on each side (in each shaft and hub assembly), otherwise bearing-roller cages foul the casing.

If end float of the shaft to be replaced is excessive, remove the hub and check the thickness of shims after removing the backing plate. If this is already less than 0.045 in. or if removal of shims for adjustment will render it so, it will be necessary to remove the hub from the other side shaft and adjust the end float by equalising the shims behind each backing plate.

Remove the split pin, nut and washer from the hub end of the shaft and withdraw the hub, using a suitable extractor, screwed on to the threaded end of the hub. Remove the backing-plate assembly and assemble with shims to the thickness of 0.045 in.

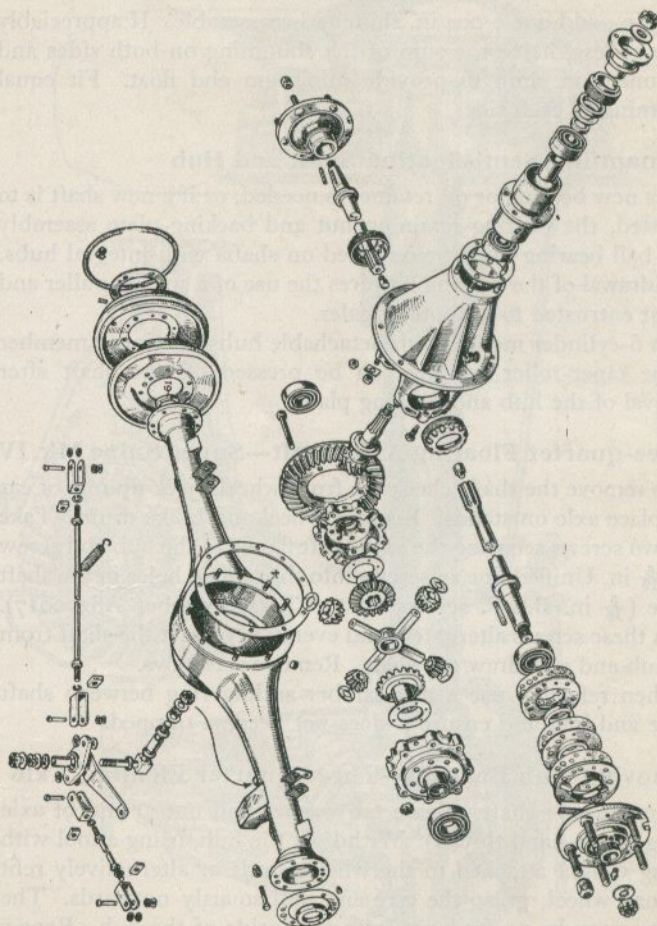


FIG. 3.—EXPLODED VIEW OF SEMI-FLOATING SPIRAL-BEVEL REAR AXLE—SIX CYLINDER SIDE-VALVE MODELS.

Remove the hub and backing plate assembly on the other side, take out the shims, temporarily refit the backing plate and use feelers to assess the shimming required. If this is in the region of 0.045 in., add one 0.004 in. shim and reassemble. If appreciably more or less, halve the sum of the shimming on both sides and add one thin shim to provide minimum end float. Fit equal shimming to each side.

Dismantling Semi-floating Shaft and Hub

If a new bearing or oil retainer is needed, or if a new shaft is to be fitted, the bearing-retaining nut and backing-plate assembly with ball bearing must be removed on shafts with integral hubs. Withdrawal of the bearing requires the use of a special puller and is best entrusted to a Rootes Dealer.

On 6-cylinder models with detachable hubs, the inner member of the taper-roller bearing can be pressed off the shaft after removal of the hub and backing plate.

Three-quarter Floating Axle Shaft—Super Snipe Mk. IV

To remove the shaft, check the front wheels, jack up rear of car and place axle on stands. Remove wheel and brake drum. Take out two screws securing the axle-shaft flange to the hub and screw two $\frac{5}{16}$ in. Unified fine setscrews into the tapped holes in the shaft flange ($\frac{5}{16}$ in. B.S.F. screws up to Chassis number A8200017). Turn these screws alternately and evenly to extract the shaft from the hub and withdraw the shaft. Remove setscrews.

When refitting, use a new rubber sealing ring between shaft flange and hub and ensure it does not become trapped.

Removing Hub Bearing—Three-quarter Floating Axle

Remove axle shaft, release tab washer and nut at end of axle casing (right-hand thread). Withdraw the hub, using a tool with sliding weight attached to the wheels studs or alternatively refit the road wheel, grasp the tyre and pull smartly outwards. The bearing may be pressed out from the inside of the hub. Renew the oil seal if necessary. Press the new bearing into place and lubricate with roller-bearing grease. Fit a new lockwasher to the retaining nut.

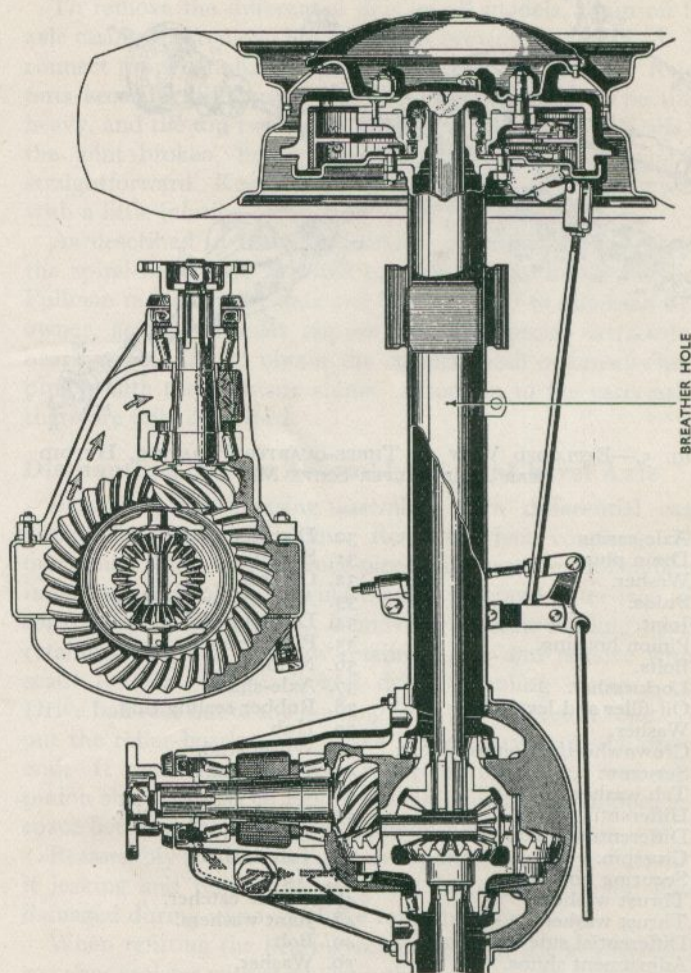


FIG. 4.—SECTIONAL VIEWS OF THREE-QUARTER FLOATING, HYPOID REAR AXLE—SUPER SNIPE Mk. IV.

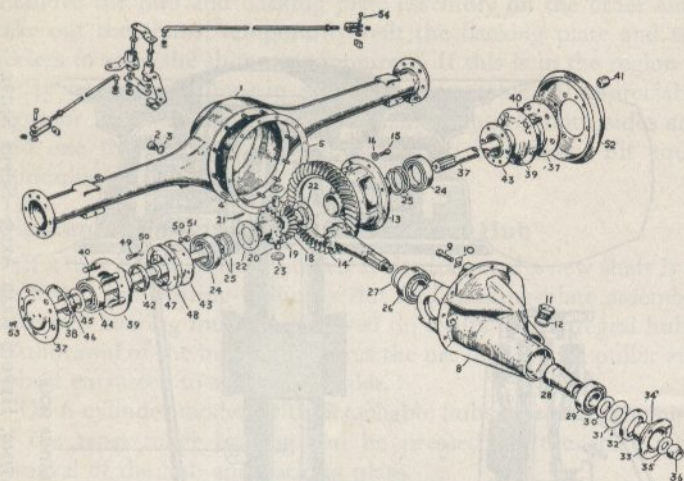


FIG. 5.—EXPLODED VIEW OF THREE-QUARTER FLOATING, HYPOID REAR AXLE—SUPER SNIPE MK. IV.

- | | |
|---------------------------------|---------------------------|
| 1. Axle casing. | 30. Distance piece. |
| 2. Drain plug. | 31. Shield. |
| 3. Washer. | 32. Oil seal. |
| 4. Studs. | 33. Axle-driver coupling. |
| 5. Joint. | 34. Dust shield. |
| 8. Pinion housing. | 35. Plain washer. |
| 9. Bolts. | 36. Nyloc nut. |
| 10. Lockwasher. | 37. Axle-shaft. |
| 11. Oil-filler and level plug. | 38. Rubber sealing ring. |
| 12. Washer. | 39. Hub. |
| 14. Crownwheel/pinion assembly. | 40. Wheel stud. |
| 15. Setscrew. | 41. Wheel nut. |
| 16. Tab washer. | 42. Oil seal. |
| 18. Differential wheel. | 43. Hub-bearing carrier. |
| 19. Differential pinions. | 44. Hub bearing. |
| 20. Crosspin. | 45. Tab washer. |
| 21. Securing pin. | 46. Nut. |
| 22. Thrust washers. | 47. Grease catcher. |
| 23. Thrust washers. | 48. Joint washers. |
| 24. Differential side bearings. | 49. Bolt. |
| 25. Adjustment shims. | 50. Washer. |
| 26. Inner bearing. | 51. Nut. |
| 27. Shims. | 52. Brake drum. |
| 28. Distance piece. | 53. Axle flange screw. |
| 29. Outer bearing. | 54. Clevis pin. |

DIFFERENTIAL UNIT

To remove the differential unit on all models, drain oil from axle casing and remove both shafts as previously described. Disconnect propeller shaft from rear-axle driven coupling. Remove nuts securing differential housing to axle casing. The unit is heavy, and the top two nuts should be left on a few threads, and the joint broken, before lifting out the unit. Reassembly is straightforward. Keep joint faces clean and use a new joint washer with a little jointing compound. Bleed the brakes.

As described in the introductory paragraphs of this chapter, the spiral-bevel axle as fitted to early Hawk, Super Snipe and Pullman models is the only one lending itself to attention by the owner, as hypoid axles require jigs and special extractors for bearings in order to obtain the correct mesh of crownwheel to pinion with the requisite shims. Attention to the early axles is therefore only described.

Dismantling Pinion Assembly—Spiral-bevel Axle

Remove pinion-housing assembly from differential casing, noting the number of shims. Remove driven coupling. Drive out pinion shaft with distance piece, oil guard and roller-bearing inner race and rollers, leaving the ball race and outer race of the roller bearing in position. Remove grubscrew holding bearing-retaining ring and unscrew retaining ring and remove with oil seal. Remove oil guard and driven-coupling distance piece. Drive ball race out of the housing from the differential end. Press out the roller-bearing outer race if necessary from the opposite end. If necessary press the roller-bearing inner race off the pinion shaft. A special tool is available for this operation, as the space between the bearing and pinion head is limited.

Reassembly is a reversal of these operations. Renew the oil seal if leaking and renew the oil guard behind the pinion head if damaged during removal of the roller bearing.

When refitting the bearing-retaining ring, the grubscrew hole may not register with the hole in the housing. An additional hole is provided in the housing (tapped) through which a new hole can be drilled in the retaining ring, after the latter has been fully

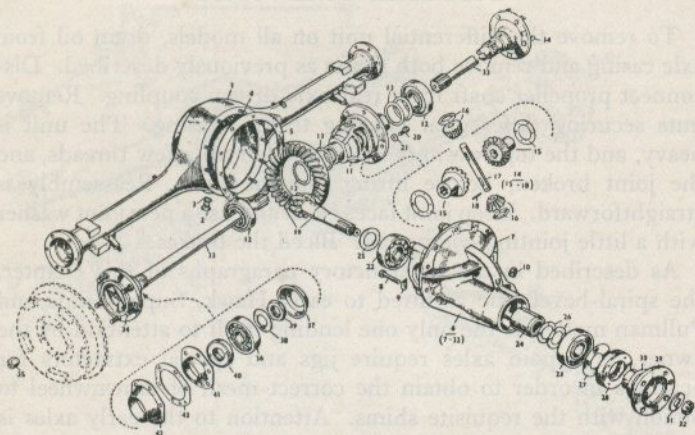


FIG. 7.—EXPLODED VIEW OF SEMI-FLOATING, HYPOID REAR AXLE—
HAWK FROM Mk. III ONWARDS AND SUPER SNIPE SERIES I TO III.

- | | |
|--|--|
| 1. Axle casing. | 21. Tab washer. |
| 2. Drain plug. | 22. Inner bearing. |
| 3. Washer. | 23. Outer bearing. |
| 4. Stud. | 24. Bearing spacer. |
| 5. Joint. | 25. Shims. |
| 6. Bevel-pinion housing assembly. | 26. Shims. |
| 7. Bevel-pinion housing. | 27. Oil baffle. |
| 8. Bearing-housing bolt. | 28. Oil seal. |
| 9. Washer. | 29. Coupling. |
| 10. Oil-filler and level plug. | 30. Dust shield. |
| 11. Differential cage. | 31. Washer. |
| 12. Side bearings. | 32. Castle nut. |
| 13. Adjustment shims. | 33. Axle shaft. |
| 14. Differential assembly. | 34. Wheel studs. |
| 15. Differential wheels and thrust washers. | 35. Wheel nut. |
| 16. Differential pinions and thrust washers. | 36. Hub bearing. |
| 17. Cross pin. | 37. Oil deflector
(Series I onwards.) |
| 18. Securing pin. | 38. Lockwasher. |
| 19. Crownwheel and pinion. | 39. Nut. |
| 20. Bolt. | 40. Oil seal. |
| | 41. Hub casing. |
| | 42. Oil catcher. |

43. Joints.

tightened. The pinion should be free and without perceptible end float. Renew the ball race if necessary.

Differential and Crownwheel—Spiral-bevel Axle

Dismantling.—Remove bearing-adjusting-ring dowel bolts from bearing caps. Remove split pins and nuts and lift off bearing caps. Note marking on cap and housing one side for correct reassembly. Remove bearing-adjusting rings.

Remove differential box and crownwheel assembly. See that bearing-outer tracks do not become interchanged. Remove fixing bolts and crownwheel from differential box, which may be split if necessary. Note positions of pinions, cross pins and thrust washers. If the bearing-inner races are faulty, these should be removed with a special tool.

Reassembling.—In all cases the crownwheel and pinion must be replaced as a pair. Replace wheels and pinions in the crownwheel half of the differential box. This is spigoted on its inner face. Refit all six thrust washers. If the differential box has to be replaced, both halves must be changed. Smear the thrust washers with grease before reassembly.

When refitting the second half of the differential box, ensure that the stamped marks on the two outer faces of the halves are in line. See that the pinions rotate freely. Replace crownwheel on the male half of the differential box ensuring that mating faces are clean. Refit bearings in original positions occupied. If bearings are new keep each inner race with its outer track. Tighten and pin crownwheel bolts and nuts.

Lower the whole unit into differential housing and push crownwheel away from pinion as far as it will go. Refit adjusting rings and bearing caps as marked, but do not fully tighten. Screw adjusting rings towards each other until the crownwheel assembly starts binding, and ease one adjusting ring back two notches. This will put the bearings in correct adjustment, i.e. free with no perceptible end float.

Adjustment of Crownwheel to Pinion—Spiral-bevel Axle

Ensure that the pinion-driven coupling nut is tight and pinned, also the crownwheel to differential-box fixing bolts and nuts. Fit

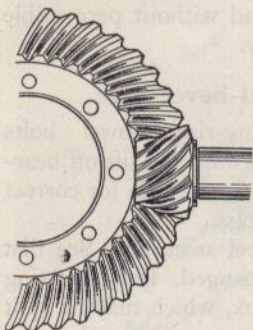


FIG. 8.—SHOWING CORRECT
TOOTH MARKING OF CROWN-
WHEEL AND PINION.

the pinion housing with the shims to locate the heel (large end) face of the pinion head flush with the outer circle of the crown-wheel teeth. Screw each bearing-adjusting ring an equal amount of notches in the direction required to give 0.006–0.008 in. backlash between crownwheel and pinion teeth. Paint the crown-wheel with engineer's marking or red lead and oil and revolve it whilst holding the driver coupling with the other hand to apply load. The marking should be as shown in Fig. 8.

REAR-AXLE RATIOS

Hawk Mk. I and II	4.7:1	Super Snipe Mk. IV	3.7 or 3.9:1*
Hawk Mk. III to VI	4.55:1	(early)	
Hawk Series I, Ia, II	4.22:1	Super Snipe Mk. IV	4.1:1
Snipe 18 h.p. Mk. I	4.67:1	(later)	
Super Snipe Mk. I	4.09:1	Super Snipe Series	4.55:1
to III and Pullman		I, II and III	

* Chassis numbers commencing A82, indicated by suffix /7 or /9.

CHAPTER VIII

FUEL SYSTEM

Fuel Pump

ON all models fuel is supplied from the tank to the carburetter by a pump of the diaphragm-type, actuated by an eccentric on the camshaft.

Two basic types of fuel pump are used; the original type, as fitted to all earlier models with side-valve engines, having a detachable metal-top cover which is removed when cleaning the filter gauze, whilst later-type pumps fitted to all overhead-valve models have a separate filter mounted over a glass bowl, which is removed when cleaning the filter gauze. The glass bowl acts as a sediment trap.

Cleaning the fuel-pump filter gauze, after removing the set-screw in the filter cover on early pumps or the glass bowl on later units, is the only maintenance required. Wash the gauze in clean petrol, wipe out the sediment, clean the pump face and refit the cover with a new joint if required. Do not overtighten the cover screw. The glass bowl on later pumps is retained by a clip pivoted on the inlet end of the pump body with a hand screw under the bowl.

A hand primer is fitted and is for use if the carburetter float chamber has become empty, as happens after the car has been out of use for a few days. A few pulls upwards of the priming lever will fill the float chamber with fuel and assist in easy starting.

Fuel Starvation

If the pump should fail to deliver fuel to the carburetter the following should be checked.

(a) Sufficiency of fuel in tank. Tightness of pipe unions from tank to pump. Use two spanners, one to hold the union in the tank or pump and a second spanner to tighten the union nut on

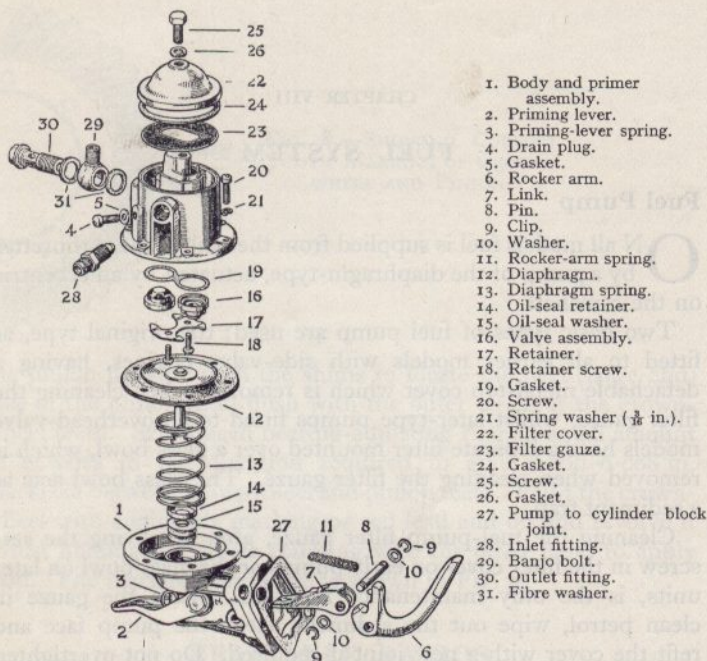


FIG. 1.—EARLY-TYPE FUEL PUMP.

the pipe. It may be necessary to slacken the latter to check that the union itself is tight first, and then re-tighten the nut.

(b) That the pump filter is clean and the cork or rubber washer is in good condition, to obviate air leaks.

(c) That with the delivery pipe from pump to carburettor disconnected, a well defined spurt of fuel passes through the pipe every alternative engine revolution.

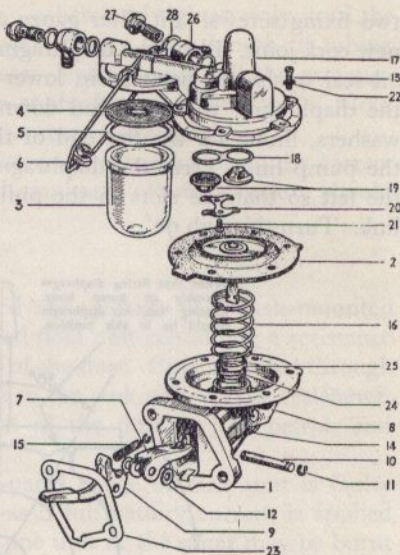
(d) If fuel starvation is still present, the pipe from tank to pump may be blocked by sediment, or the pump is in need of dismantling or renewal.

Dismantling Fuel Pump

Clean the exterior and make a mark across the two flanges

FIG. 2.—LATER-TYPE FUEL PUMP.

1. Body.
2. Diaphragm assembly.
3. Glass filter bowl.
4. Filter gauze.
5. Filter gasket.
6. Filter-bowl retainer.
7. Link.
8. Priming handle.
9. Rocker arm.
10. Rocker-arm pin.
11. Clip.
12. Rocker-pin washer.
13. Upper-casting screw.
14. Priming lever spring.
15. Rocker-arm spring.
16. Diaphragm spring.
17. Upper casting.
18. Valve gasket.
19. Valve and seat assembly.
20. Valve retainer.
21. Valve-retainer screw.
22. Washer.
23. Engine-pad gasket.
24. Oil-seal washer.
25. Retainer.
26. Outlet connection.
27. Banjo bolt.
28. Fibre washer.



clamping the diaphragm. Remove six screws and separate the two halves of the main casing.

Examine the four layers of the diaphragm for damage or splitting of the fabric. If faulty, remove the diaphragm from the pump by turning the head through an angle of 90° , when the end of the pull rod may be disconnected from the slot in the securing link and the diaphragm withdrawn. Remove diaphragm spring, oil seal, spring and oil-seal washer. Withdraw the valve-retainer screws from inside the upper casting and remove the retainer plate, valve assemblies and valve-retainer gasket.

Fuel-pump failure is normally associated with a faulty diaphragm or faulty valves and replacement of either or both of these items will often rectify the complaint.

Further dismantling of the pump is not recommended, as wear in the rocker-arm linkage after extensive service is best remedied by fitting a replacement pump assembly.

Reassembling Fuel Pump

Replace valve-retainer gasket, valves, valve retainer and fit the

two fixing screws. Fit filter gauze and then filter cover using a new cork joint. Place the diaphragm spring, oil-seal retainer and oil-seal washer in position in lower half of pump body. Enter the diaphragm, with pull rod downwards, over the spring and washers, lining up the flat end of the pull rod with the slot in the pump link. Press the diaphragm downwards and turn it to the left so that the slots in the pull rod engage the fork in the link. Turn through 90° .

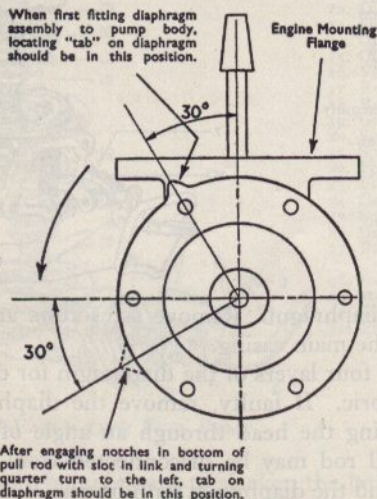


FIG. 3.—FITTING FUEL-PUMP DIAPHRAGM.

To ensure that the six diaphragm screw holes line up with those in the two halves of the pump body, the diaphragm assembly should be entered into the lower half of the body with the small tab on the outer circle facing the 11 o'clock position, when the pump lever is at 12 o'clock. After turning to lock, the tab will assume the 8 o'clock position (Fig. 3).

Push the rocker arm towards the pump until the diaphragm is level with the body flanges and place the upper half of the pump into position with the markings on the two flanges corresponding.

Install the screws and spring washers and tighten only until the heads just engage the washers. Place a 4-in. length of tubing over the rocker arm to increase leverage and pull the arm upwards to hold the diaphragm at the bottom of its stroke. Hold in this position and tighten the screws alternately.

The pump may now be refitted to the engine, using the correct joint between pump face and crankcase. Pump pressure should be $2\frac{1}{2}$ – $3\frac{1}{2}$ lb/sq. in.

Fuel Gauge

This is electrically operated and consists of a dash-mounted gauge unit and a tank-mounted float unit containing a resistance which is varied by movement of the float. Current is fed through the ignition switch and gauge to the tank unit via the resistance, which varies with the height of the float on the petrol, and thence to earth.

To determine if the dash-panel gauge or tank unit is faulty test as below, but take care, as if full battery current is applied on any incorrect connection, one unit or the other may be burnt out.

If the gauge always reads *empty* with the ignition on there is a short-circuit at some point, whilst if a *full* reading is shown, there is an open circuit. To test, switch on the ignition and disconnect the fuel gauge wire—taking care not to 'earth' it: the gauge should read full. If the bare end of the wire from the gauge be then earthed, the gauge should read empty. If both tests are in order, the gauge and wiring are satisfactory.

To test further, switch off the ignition and re-connect the gauge wire and disconnect the tank-unit lead. When the ignition is on, the gauge unit should read empty when the wire is earthed and full when disconnected. Should both tests be in order, the fault probably lies in the tank unit and this should be replaced. Renew the cork joint and ensure that no leaks can take place.

Air Cleaners

These are mainly of the oil-bath type and contain a gauze element which should be washed in paraffin every 6,000 miles, or more frequently in dusty conditions. The oil container below

the element should be drained and wiped clean at the same time, and refilled with clean engine oil to the mark indicated by an arrow in the container. Do not overfill.

On Hawk Mk. V models a separate air silencer, containing an additional element, is fitted over the carburetter and is connected by flexible hose to the main air cleaner. The air-silencer element should be washed and oiled in this case.

Make sure that the synthetic rubber collar is in position below the cleaner element before refitting the element. Cleaners are secured together by a stud and wing nut on earlier types and by clips on later types, reverting to the wing-nut type on some of the latest models, which have a renewable filter element.

Carburetters

Stromberg carburetters are fitted to all Hawk models up to the new series I and Ia cars and to all 6-cylinder models up to the new Super Snipe Series II. These later models employ Zenith carburetters of similar design to the Stromberg, apart from the float-chamber assemblies.

Stromberg carburetters fitted to all Hawk models up to and including Mk. IV, to all 6-cylinder side-valve models and to early Super Snipe Mk. IV and all Pullman models were originally fitted with automatic chokes operated by a thermostat assembly on the exhaust manifold and incorporating stages of richness and fast idling during warming-up period. Later types employ manually-operated chokes in which the mid-position of the choke control incorporates a fast-idle system, obviating the need for a hand throttle.

Starting from Cold

Automatic Choke.—First press the accelerator pedal to the floor and release it once. This frees the stepped cam and allows the automatic choke to close the strangler under tension of the thermostat spring in the assembly on the exhaust manifold. Switch on the ignition and press the starter. The engine should fire and run. The car may now be driven away from cold without misfiring. Do not leave to warm up.

In very cold weather it is advisable to press the accelerator

down several times before starting. This injects fuel from the accelerator pump into the inlet manifold.

Manual Choke.—Before starting pull the choke control right out, switch on the ignition and operate the starter. The engine should fire and run on “fast idle”. Push the choke partly in as soon as possible to obviate the engine “hunting” and push it fully in as soon as the engine will pull normally. Do not use the choke when the engine is hot.

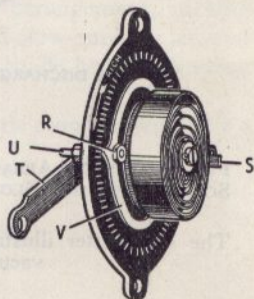
Thermostat Adjustment (Automatic Choke)

The thermostat spring is sensitive to temperature changes and the ideal temperature in which it should be set is 70° F.

- (1) Loosen the nut (*R*) Fig. 4.
- (2) Unhook the end of the spring from the prong (*S*).
- (3) With the spring free hold the lever (*T*) against the checking pin (*U*) in the closed position.

FIG. 4.—THERMOSTAT FOR
OPERATING AUTOMATIC
CHOKE.

R. Nut.
S. Prong.
T. Lever.
U. Checking pin.
V. Pointer.



- (4) Rotate the prong (*S*) until it just touches the outside of the spring loop.

(5) Check that the pointer (*V*) is now opposite the “O” mark.

(6) It may be necessary to remove the old “O” mark and make a new one opposite the pointer.

(7) Check, and re-position if necessary, the position of the centre dot marking the tension setting. If the zero point has been altered, the setting (centre dot) point must be altered to correspond (see 8).

- (8) Adjust the setting 17 notches rich on Hawk, 18 notches

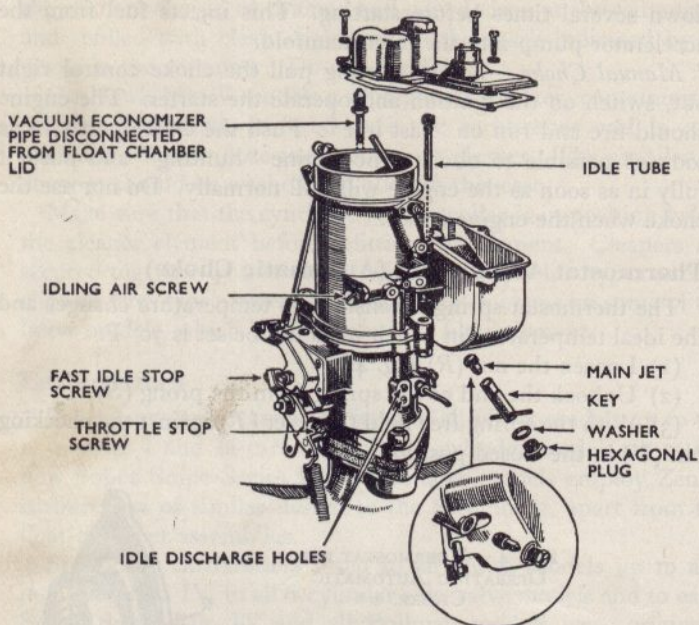


FIG. 5.—TYPICAL ARRANGEMENT OF AIR SCREW AND THROTTLE STOP SCREW USED FOR SLOW RUNNING ADJUSTMENTS ON STROMBERG CARBURETTERS.

The carburettor illustrated is an automatic strangler-type with vacuum economiser system.

rich on Super Snipe and Pullman side-valve, and 12 notches rich on Super Snipe Mk. IV and Pullman overhead-valve models.

(9) Slip the loop of the spring over the prong (*S*).

(10) Turn the cage until the pointer on the ring (*V*) is opposite the centre dot.

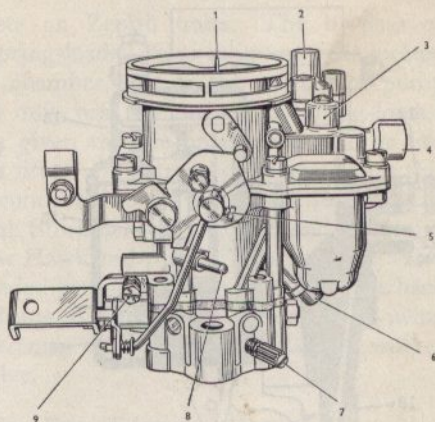
(11) Tighten the nut (*R*).

Slow-running Adjustment

Never adjust the slow running except when the engine is hot. An adjustment made when the engine is cold will be too rich when hot and may upset the running of the engine, especially in

FIG. 6.—ZENITH
42 WIA CARBURETTER.

1. Strangler valve.
2. Economy device.
3. External air-vent cover.
4. Fuel inlet.
5. Fast idle adjustment.
6. Main metering jet.
7. Slow-running volume-control screw.
8. Vacuum-advance connection point.
9. Slow-running speed-adjustment screw.



the low-speed range and on pick-up. The need for carburettor adjustment may be due to some ignition derangement, sticking or badly seated valves or possibly a choked slow-running jet, and an examination of these points should be made before adjusting the carburettor.

With the engine hot, screw in the throttle stop screw to give a

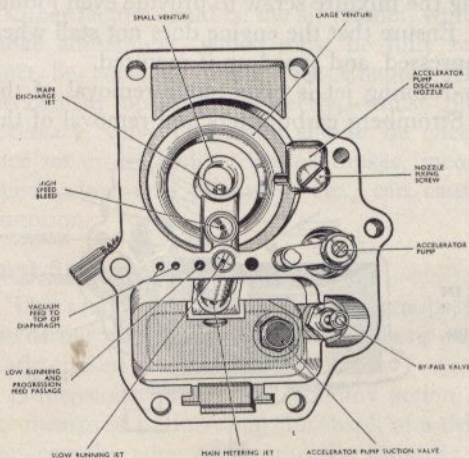


FIG. 7.—VIEW OF
ZENITH 42 WIA
CARBURETTER WITH
TOP REMOVED.

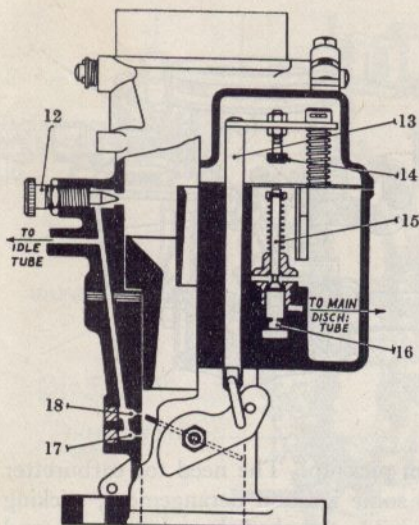


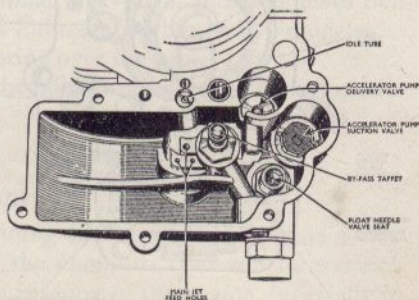
FIG. 8.—STROMBERG CARBURETTER WITH MECHANICAL-TYPE ECONOMY SYSTEM

- 12. Idling air screw.
- 13. Pump piston rod.
- 14. By-pass tappet.
- 15. By-pass valve stem.
- 16. By-pass jet.
- 17. Idle discharge hole.
- 18. Progression hole.

medium fast-idling speed. Then slacken the locknut on the idling-mixture screw and turn in or out until steady running is obtained. Gradually slow the engine by unscrewing the throttle stop screw, readjusting the mixture screw to provide even idling. Tighten the locknut. Ensure that the engine does not stall when the clutch pedal is depressed, and speed up if required.

Access to the slow-running jet is given after removal of the float-chamber lid on Stromberg carburetters and removal of the

FIG. 9.—COMPONENTS IN FLOAT CHAMBER OF STROMBERG CARBURETTER.



carburettor top complete on Zenith units. The by-pass or economiser valve with spring-loaded valve in its centre is located in the well of the float chamber next to the accelerator pump piston. This valve will only pass fuel when its spring-loaded centre is depressed at a given throttle opening by one or two methods. On all Hawks fitted with Stromberg carburettors this is by means of a tappet connected to the accelerator linkage. On all 6-cylinder models with Stromberg carburettors and on Zenith carburettors fitted to new Hawk and Super Snipe cars, the valve is opened by a spring-loaded piston when the vacuum at the back of this piston is reduced due to wide throttle openings, allowing the piston spring to overcome the vacuum and also the weaker spring of the by-pass valve.

Checking for Excessive Fuel Consumption

The carburettor is often blamed for unsatisfactory fuel consumption, and if the fuel consumption is considered excessive, make a comprehensive and logical test. See that the slow running is correctly set and examine the carburettor for external leaks. A high petrol level in the float chamber or high petrol-pump pressure are sometimes responsible for heavy consumption. Check the fuel lines for leaks at the various connections.

Other factors could be the air cleaner, which must be clean, the choke adjustment, which must be fully released; the ignition must be correctly timed (see Chapter XI) and the advance mechanism operating correctly, whilst plugs, points and, if necessary, valve clearances should be checked. Undue resistance set up by badly adjusted brakes, incorrectly toed-in front wheels, low tyre pressures, etc., can cause heavier fuel consumption.

Fuel System Specification

This section is divided into three groups, the first dealing with the earlier models fitted with Stromberg carburettors with automatic chokes.

Dimensions quoted for economy action and fast-idle setting are measured by inserting the shank of a drill of the size quoted between the edge of the throttle butterfly and the wall of the

FUEL SYSTEM SPECIFICATION I

(Stromberg Carburettors with Automatic Choke)

	<i>Hawk Mk. III</i>	<i>Hawk Mk. IV</i>
Stromberg type Carburettor	DBA 36	DBA 36
Choke (Venturi)	$\frac{31}{32}$ in.	$\frac{31}{32}$ in. or $1\frac{1}{32}$ in. with separate air silencer
Main discharge jet	L. 1833	L. 1833 or L. 1802 with separate air silencer
Metering jet	·045 in.	·045 in. (·048 in. *)
By-pass jet	·030 in.	·030 in. (·034 in. *)
Idle tube top (bleed)	75	75
Idle tube bottom (feed)	70	70
Pump-discharge jet	75	75
Pump Stroke	Short (inner hole).	Short
Idle-discharge hole	68	68
Progression hole	60	60
High-speed bleed	70	70 (60*)
Economy Action (at throttle edge)	$\frac{9}{32}$ in. (before by-pass jet opens)	$\frac{9}{32}$ in.
Vacuum Kick Setting	·075/·070 in.	·104/·099 in.
Fast-idle Setting (at throttle)	·032/·028 in.	·032/·028 in.
Needle Seating	·100 in.	(·035/·031 in. *) ·100 in.
Petrol level	$\frac{3}{4}$ in. (below float-chamber top face)	$\frac{3}{4}$ in. (below float-chamber top face)
Thermostat Setting — notches rich.	17	17

* With separate air silencer.

throttle chamber, adjacent to the idle-discharge holes. The carburettor is, of course, removed. Adjustment for economy action is then made, if necessary, to the by-pass tappet above the by-pass valve with the throttle butterfly held against the shank of the drill.

The fast-idle throttle gap is adjusted by the fast-idle stop screw so that, with the strangler valve fully closed and the fast-idle stop

FUEL SYSTEM SPECIFICATION I—(continued)
(Stromberg Carburettors with Automatic Choke)

<i>Snipe (18 h.p.) Mk. I</i>	<i>Super Snipe, Pullman Mk. I</i>	<i>Super Snipe, Pullman Mk. II and III</i>	<i>Super Snipe, Pullman Mk. IV</i>
DBVA 36	DBVA 42	DBVA 42	DBVA 42
1.06 in.	1 $\frac{3}{8}$ in.	1 $\frac{3}{8}$ in.	1 $\frac{1}{4}$ in.
L. 1719	L. 1292	L. 1292	L. 2080
.052 in.	.065 in.	.065 in.	.065 in.
.044 in.	.054 in.	.054 in.	.056 in.
75	75	75	75
68	64	64	64
70	68	68	68
Short	Short	Short	Short
68	70	68	68
54	53	53	60
70	70	70	52
Vacuum, not Adjustable	Vacuum, Not Adjustable	Vacuum, Not Adjustable	Vacuum not Adjustable
.223/.218 in.	.223/.218 in.	.223/.218 in.	.223/.218 in.
.032/.028 in.	.032/.028 in.	.032/.028 in.	61-58 Morse drill
.100 in.	.100 in.	.113 in.	.113 in.
$\frac{3}{4}$ in. (below float - chamber top face)	$\frac{3}{4}$ in. (below float - chamber top face)	$\frac{3}{4}$ in.	$\frac{3}{4}$ in.
18	18	18	12

screw on the centre step of the cam, the correct diameter drill will pass between the butterfly and the throttle body adjacent to the idle-discharge holes.

The second group deals with models having the Stromberg carburettor with manual choke, whilst Zenith carburettors as fitted to the new Hawk Series I and Ia and the Super Snipe Series II are covered in the third group.

FUEL SYSTEM SPECIFICATION II

(Stromberg Carburettors with Manual Choke)

	<i>Hawk Mk. V</i>	<i>Hawk Mk. VI</i>	<i>Super Snipe Mk. IV (Later Models)</i>	<i>New Super Snipe Series I</i>
Stromberg type Carburetter	DAA 36	DI 36	DIV 42	DIV 42
Choke (venturi)	1 $\frac{1}{32}$ in.	1 $\frac{3}{32}$ in.	1 $\frac{3}{8}$ in.	1 $\frac{5}{16}$ in.
Main-discharge jet	L. 1802	L. 1840	L. 2080	L. 2080
Metering jet	·048 in.	·052 in.	·072 in.	·068 in.
By-pass jet	·034 in.	·040 in.	·056 in.	·062 in.
Idle tube top (bleed)	75	75	75	75
Idle tube bottom (feed)	70	70	64	64
Idle-discharge hole	68	68	68	68
Progression hole	60	60	60	60
High-speed bleed	60	60	52	52
Pump-discharge jet	75	75	68	70
Pump-link position	inner hole	inner hole	inner hole	Outer hole
Float-needle Seating	·100	·100	·113 in.	·113 in.
Economy Action	$\frac{9}{32}$ in.	$\frac{9}{32}$ in.	Vacuum L. 1785 Spring (black)	Vacuum L. 1785 Spring (black)
Fast-idle gap	·032/·028 in.	·047 in.	·060 in.	·046 in.

FUEL SYSTEM SPECIFICATION III

(Zenith Carburetters)

	<i>New Hawk Series I, Ia, II</i>	<i>New Super Snipe Series II and III</i>
Zenith type Carburetter	36 WIA	42 WIA
Choke (Venturi)	28	33
Main-discharge jet	016289	220968
Main jet	130	165 (oil-bath air cleaner) 170 (dry element)
By-pass	97	130 (oil bath) 150 (dry element)
High-speed bleed	180	180
Slow running	50	50 (oil-bath air cleaner) 45 (dry element)
Progression No. 1	80	1.1 mm.
Progression No. 2	80	0.8 mm.
Slow-running air bleed	150	150
Fast-idle gap	.046 in.	.040 in.
Needle Seating	2 mm.	2.25 mm.
Pump jet	50	50
Pump Stroke	Short	long
Petrol level	19 mm. below top face	$\frac{3}{4}$ in. below float chamber top face

CHAPTER IX

BRAKES

ALL Humber models are fitted with hydraulic brakes. Hawk Mk. I and II and Snipe, Super Snipe and Pullman Mk. I, with leading and trailing shoes all round, have snail-cam external adjusters, one for each shoe, on each brake backplate for the front-wheel brakes and serrated wheel adjusters on rear brakes.

Brake Adjustment (Hawk Mk. I and II, Snipe, Super Snipe and Pullman Mk. I)

Tighten each front hexagonal adjuster on the backplate (two each side) until the shoe just binds, and back off until just free.

Remove rear-wheel nave plates and turn each wheel until the serrated wheel adjuster is visible through the holes in the wheel and brake drum. Insert a screwdriver through these holes and turn the adjuster until the shoes just bind, and then back off until free.

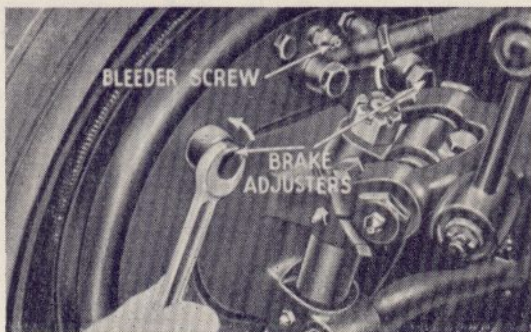


FIG. 1.—FRONT-BRAKE ADJUSTMENT ON EARLY MODELS WITH LEADING AND TRAILING SHOE FRONT AND REAR BRAKES.

Brake Adjustment (Hawk Mk. III to Series Ia, Super Snipe and Pullman Mk. II to IV)

Brake adjustment on all these models with two leading-shoe front brakes and leading- and trailing-shoe-rear brakes is done with a screwdriver inserted through holes in the wheel and brake drum, with the nave plates removed.

Front Brakes.—With the handbrake on, remove nave plate from one front wheel and jack up until free to rotate. Turn the wheel so that the hole in the road wheel and brake drum is opposite the

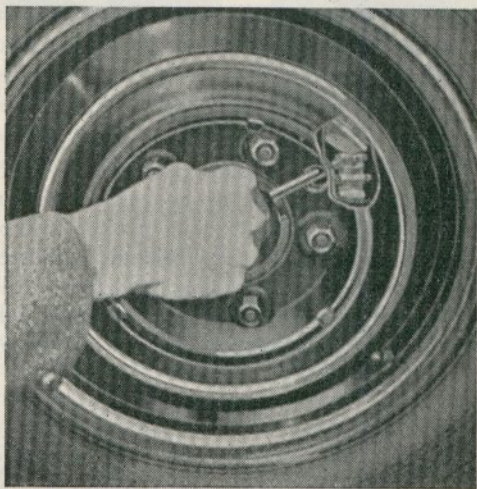
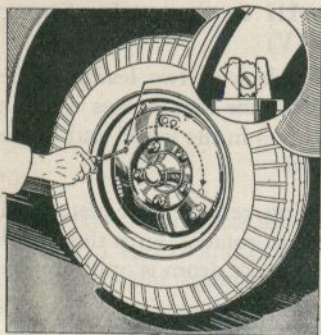


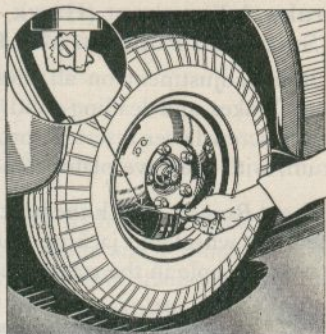
FIG. 2.—REAR-BRAKE ADJUSTMENT ON EARLY MODELS WITH LEADING AND TRAILING SHOE FRONT AND REAR BRAKES.

slotted head of one of the “Micram” adjusters as shown in Fig. 3. Turn the adjuster clockwise with a screwdriver until the shoe rubs the drum and release one notch. Give the wheel half a turn and repeat as above. Note that there are two shoes to adjust on each front brake.

Rear Brakes.—With the front wheels on the ground chock one



Front Brake.



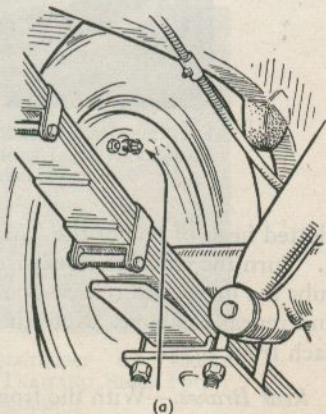
Rear Brake.

FIG. 3.—BRAKE ADJUSTMENT ON LATER MODELS WITH TWO-LEADING SHOE FRONT BRAKES AND LEADING AND TRAILING SHOE REAR BRAKES.

front wheel, to prevent the car rolling, and release the handbrake. Remove the nave plate and jack up one rear wheel until free to rotate. Turn the wheel so that the hole in wheel and brake drum is opposite the slotted head of the "Micram" adjuster (Fig. 3). Turn the adjuster clockwise with a screwdriver until the brake shoes contact the drum and then apply the footbrake hard to centralise the shoes and rear-wheel cylinder. Adjust up until the

FIG. 4.—REAR-BRAKE ADJUSTMENT ON SUPER SNIPE SERIES I to III AND HAWK SERIES II.

(a) Square-headed adjuster.



shoes just rub again and then release the adjuster one notch at a time until the wheel is free to rotate.

Note that there is only one "Micram" adjuster to each rear brake.

Brake Adjustment (New Super Snipe Series I, II and III and New Hawk Series II)

Super Snipe Series I cars are fitted with two-trailing shoe front brakes which are self adjusting and Super Snipe Series II and III and Hawk Series II models have disc-type front brakes which are also self adjusting. The braking system is servo assisted.

Rear Brakes.—Chock the front wheels, release the handbrake and jack up the rear of the car. Turn the square-headed adjuster, on each backplate, clockwise until solid resistance is felt. Slacken back the adjuster until the wheel rotates freely. Apply the foot-brake hard to centralise the shoes and recheck adjustment.

Handbrake Adjustment (All Models)

Normal shoe adjustment will usually take up the handbrake sufficiently, but if the cable has stretched, allowing excessive travel of the handbrake lever, lock the rear-brake shoes on each side by means of the shoe adjusters. With the handbrake off, adjust the cable length until the slack is taken out of the linkage. On all models up to the New Series cars, with a central compensator mounted on the axle, disconnect the cable from the compensator by removing the clevis pin and rotate the clevis after slackening its locknut. Reconnect the clevis and when the cable is adjusted to the correct length fit the clevis pin, with a new split pin. Tighten the locknut.

On the new Hawk Series I, Ia and II and new Super Snipe Series I, II and III, the cable need not be disconnected. Slacken the locknuts of the left- and right-hand threaded sleeve at the front end of the cable (behind the handbrake—under the car) and turn the sleeve whilst holding the cable hexagon, to take the slack out of the cable. Re-tighten the locknuts.

Slacken the rear-brake shoe adjusters until the wheels rotate freely.

Hydraulic System

The brake fluid is contained in a supply tank integral with the master cylinder, which is located below the front floor on all models prior to the new Series Hawk and Super Snipe. The container can be topped up after removing the floor-access plug and master-cylinder filler plug.

The latest models, with pendant pedals, have the brake and clutch cylinders located under the bonnet on the bulkhead, in front of their respective pedals.

The brake-fluid level should be kept approximately $\frac{1}{2}$ in. below the bottom of the filler-hole boss, and should be checked every time the car is serviced. Do not fill the container right up, as a small expansion space must be allowed for the fluid. Ensure that the air vent in the filler cap is not choked, as blockage at this point could cause the brakes to drag.

Brake Fluid

Use only the correct grade of fluid in the hydraulic system. Under no circumstances should oil or paraffin, etc., be allowed to come into contact with the component parts of the system. Brake fluid only should be used for cleaning any of the parts.

The recommended brake fluids are as follows:

Hawk Mk. I to Series Ia.—Lockheed Heavy-duty Fluid, Spec. 70 R.1.

Snipe, Super Snipe and Pullman Mk. I to IV Inclusive.—As Hawk models.

New Super Snipe Series I.—Lockheed or Girling Fluid, Spec. 70 R.1.

New Super Snipe Series II and III and New Hawk Series II.—Girling Brake Fluid, Spec. 70 R.3.

Bleeding Hydraulic System

Bleeding the system in order to expel all air is not a routine maintenance operation and should only be necessary when some part of the equipment has been disconnected or fluid drained off so that air has been allowed to enter. If the fluid in the master-cylinder container has become low enough to allow air to enter,

investigate and rectify the leak immediately, and then bleed the system in the following manner:

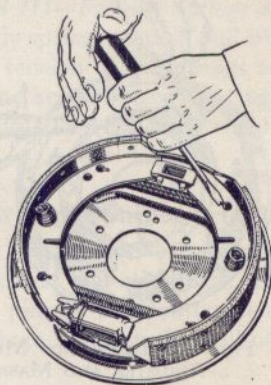
(1) Fill the fluid reservoir with the correct brake fluid and keep it at least a quarter full during the bleeding operation. With small containers top up after bleeding each wheel unit.

(2) Attach a rubber tube to the bleeder screw on the banjo connection at the wheel cylinder and submerge the free end of the tube in some brake fluid in a clean glass jar.

(3) Undo the bleeder screw nearly a complete turn, and get an assistant to press the brake pedal to the floor and allow it to return. Repeat this process and watch the fluid in the glass jar.

FIG. 5.—REMOVING PULL-OFF SPRINGS.

The Hawk Series I rear brake is shown.



Air bubbles will at first appear and, when these cease, the pedal must be held down whilst the bleeder valve is tightened. When bleeding front brakes, give two additional strokes to the foot brake after all bubbles have ceased to flow, to ensure that no air is trapped in the top cylinder.

(4) Repeat on the other wheels, one bleeder screw to each wheel.

(5) Top up the master cylinder to the correct level with fresh brake fluid.

Fluid which has become aerated in the process of bleeding should be left to stand before being re-used.

Removing Brake Shoes (Hawk Mk. III to Series Ia, Super Snipe and Pullman II to IV)

Jack up car, remove nave plates and road wheels and release handbrake. Slacken slave adjusters right back. Remove set-screws securing brake drums and remove drums.

Remove brake-shoe steady springs, where fitted, by compressing each spring and turning it a quarter turn. On some Super Snipe Mk. IV models remove anti-rattle springs by taking out the two screws securing each to its bracket.

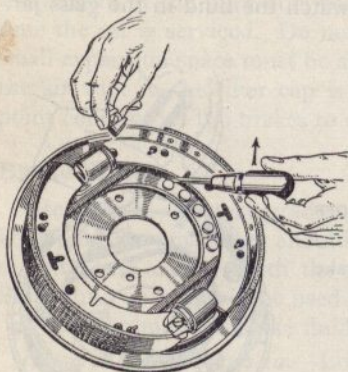


FIG. 6.—INSERTING MICRAM ADJUSTER AND MASK.

A front-brake assembly is shown.

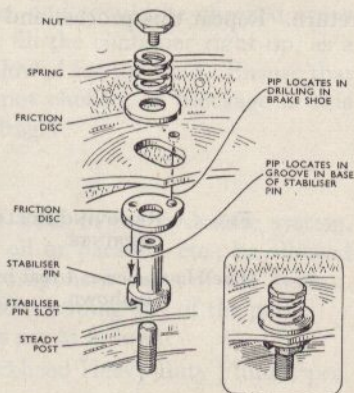


FIG. 7.—STABILISER PARTS—
SUPER SNIPE SERIES I.

On models with pull-off springs behind the webs of the shoes, dislodge the springs where they protrude through the holes in the brake-shoe webs with the blade of a screwdriver. When the springs have been disconnected from one shoe, both shoes may be removed.

On Super Snipe and Pullman Mk. II and III with pull-off springs in front of the shoe webs, release the shoes carefully by gradually taking the tension from the pull-off springs as the shoes are eased away from the backplate.

Take great care not to damage the Micram adjuster and mask.

Replacing Brake Shoes (Hawk Mk. III to Series Ia, Super Snipe and Pullman Mk. II to IV)

Types with Pull-off Springs below Shoe Webs.—Assemble the pull-off springs to the shoes, taking care to locate the ends in the correct drillings in the shoes. It is easiest to engage the ends of the two springs in one shoe first—place shoe in position without the Micram adjusters and masks; then attach free ends of springs to other shoe and pull against the tension of the springs until the second shoe can be positioned. Pull against the tension of the springs and insert Micram adjusters and masks in the slots in the tips of the shoes. Refit steady springs (Hawk) or anti-rattle springs with two screws (Super Snipe Mk. IV, where fitted).

Super Snipe and Pullman Mk. II and III—Pull-off Springs at Top.—Position one shoe and insert steady spring. Attach pull-off springs to both shoes, pull against the tension of the springs to position the second shoe and insert the second steady spring. Note that the pull-off springs must be fitted above the webs of the shoes.

Removing Front-brake Shoes (New Super Snipe Series I)

Remove brake drum. Slacken the brake-shoe steady-post locknut on the back of the brake backplate and slack back the steady post. Remove the anchor pivot pin, by unscrewing from each wheel cylinder, and lift out the shoes. Detach the pull-off spring from the shoe and backplate.

Replacing Front-brake Shoes (New Super Snipe Series I)

Smear the tops of the steady posts and the operating ends of the new shoes with white brake grease, which must not come into contact with any other parts. Pair the shoes and assemble the stabiliser parts to each shoe, ensuring that the pips in the lower friction disc locate correctly in the stabiliser pin and brake shoe as shown. Hold the stabiliser parts lightly in position; do not fully tighten the nut.

Hook the short end of one spring round the peg beneath the shoe web and the long end round the peg on the backplate. Place the end of the shoe into the abutment slot on the wheel-cylinder

body and then ease the other end into the piston of the opposite wheel cylinder. Make sure that the slot in the stabiliser locates correctly on the steady post, and hold the base of the stabiliser with a $\frac{3}{8}$ -in. Whitworth spanner whilst fully tightening the stabiliser nut.

Refit the brake drums and centralise the shoes by releasing the wheel cylinder-to-backplate setscrews and brake-shoe pivot-pin nuts three-quarters of a turn, and re-tightening with the brake pedal lightly applied. Adjust the brake-shoe steady posts, with the brake pedal applied, by turning them with a screwdriver in a clockwise direction until the post contacts the web of the shoe. Tighten the locknuts.

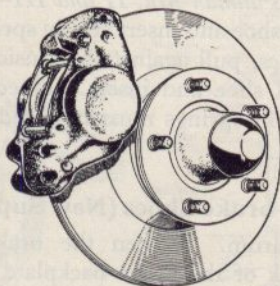


FIG. 8.—GIRLING DISC FRONT BRAKE USED ON HAWK SERIES II AND SUPER SNIPE SERIES II and III.

Rear-brake Shoes (Super Snipe Series I to III and Hawk Series II)

These are of the leading- and trailing-shoe type with external adjusters. Dismantling and reassembling is straightforward. Adjust the steady posts as already described.

Disc Front Brakes (Super Snipe Series II and III and Hawk Series II)

Maintenance.—The brake pads and rubber seals should be inspected for damage or wear at intervals of not more than 5,000 miles. The brake pads should be renewed when the linings are

worn down to $\frac{1}{16}$ in. thick. Pads should not be allowed to wear below this figure. The brake-fluid level in the reservoir should be regularly checked.

The brake pads are easily replaced and instructions for this work are given below. Replacement of seals and dust excluders necessitates removal of the calipers from the stub axles and, if this operation is attempted, great care must be taken to replace the small shims in the caliper mounting to ensure correct alignment of the caliper with the disc.

Removing Brake Pads.—Jack up car and remove front wheels. On the rear of each caliper are two retaining pins, each of which is held in place by a spring clip. Extract the clips, pull out the pins and, using a screwdriver, lever the pads from their positions on either side of the discs.

Replacing Brake Pads.—Push the operating pistons, with an even pressure, to the bottom of the cylinder bores in the caliper. Fit the brake pads, retaining pins and clips. Pump the brake pedal until solid resistance is felt. Refit road wheels, lower the jack and road test the car.

FRONT SUSPENSION AND STEERING

TRANSVERSE LEAF-SPRING SUSPENSION

HAWK Mk. I and II, Super Snipe Mk. I to III and all Pullman and Imperial models have a low-mounted transverse leaf spring with triangulated upper wishbones. Spring eye-bolts and link bearings have screwed bushes.

Adjust front-wheel track (toe-in) by slackening locknuts and rotating the longer track-rod cross tube, the ball joints of which have left- and right-hand threads. Front wheels toe-in $\frac{1}{8}$ in. laden.

Adjust wheel camber, after checking to see that front-spring laden camber is correct, by slackening link-connector pinch bolt and rotating eccentric upper-link outer pin. Wheel camber is 1° positive with car laden.

Renewing King Pins and Bushes

Jack up front wheel under end of spring. Remove front wheel and brake drum. Prise off hub cap, remove split pin, castellated nut and lockwasher and withdraw front hub. Take off inner member of inner bearing from stub-axle spindle.

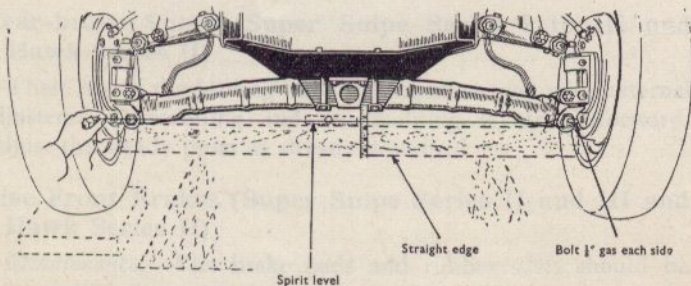


FIG. 1.—CHECKING FRONT-SPRING CAMBER ON EARLY MODELS WITH TRANSVERSE LEAF-SPRING SUSPENSION.

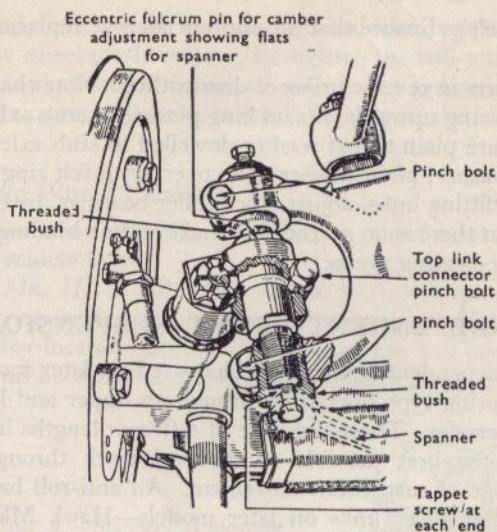


FIG. 2.—WHEEL-CAMBER ADJUSTMENT ON EARLY MODELS WITH TRANSVERSE LEAF-SPRING SUSPENSION.

Disconnect steering arm from track rod. Remove brake backplate assembly, taking care of the hub-grease catcher and joint. Support the backplate, to avoid the hydraulic brake pipe taking the weight, by tying up out of the way. Remove split pin, nut and washer securing link connector to top of king pin and tap off link connector. Lift off thrust-washer cover, felt washer, top thrust washer, centre and lower thrust washers, noting order of removal. Lift off stub axle, lower distance piece and felt washer. Note dowel between lower thrust washer and top of stub axle. Knock down tab washer of spring eyebolt and screw out eyebolt, which is threaded in spring bush and fork.

To renew king-pin bushes remove old bushes by collapsing them inwards with a chisel or splitting them. Remove distance tube which will now be freed.

Press in new bushes until about 0.020 in. below thrust face to ensure that they register with the distance tube which must be held in position as the bushes are pressed in. Line ream bushes to 0.938—0.9372 in. (early models) and 1.0005—0.9997 in.

(later models). Ensure that the appropriate size replacements are supplied.

Refit parts in reverse order of dismantling. Note that grooved collar, felt ring upwards, fits on king pin below stub axle. Above stub axle are plain thrust washer dowelled to stub axle top face, grooved washer, plain washer and cover, with felt ring inside.

After refitting hubs, adjust taper-roller bearings, by castellated nut, so that there is no perceptible shake and no binding. Repack with roller-bearing grease.

INDEPENDENT FRONT SUSPENSION

The independent front suspension used on later models is of the coil-spring type operating through an upper and lower link to a stub carrier. These links are of different lengths in order to maintain the best possible front-wheel track throughout the whole range of suspension movement. An anti-roll bar is fitted between the lower links on later models—Hawk Mk. VI and Super Snipe Mk. IV onwards.

Adjusting Front-wheel Toe-in

Adjust the front-wheel toe-in by rotating the two outer track

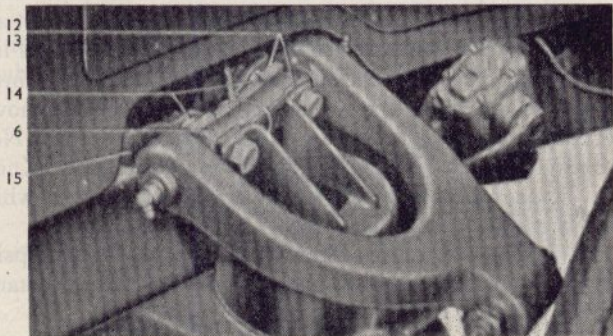


FIG. 3.—WHEEL-CAMBER ADJUSTMENT ON HAWK Mk. III TO VI

6, Upper fulcrum pin; 14, Distance pieces; 12, 13, Wiring of shims. 15, Upper bracket.

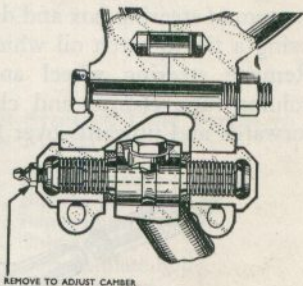
rods equally one way or the other after slackening the locknuts. The front wheel toe-in is $\frac{1}{8}$ in. Re-tighten the ball-joint locknuts and ensure that the ball pins and sockets are in line, so that the track rod can turn slightly, to avoid necking of the ball joints in service.

Adjusting Wheel Camber

This dimension should be $\frac{3}{4}^{\circ}$ positive $\pm \frac{1}{4}^{\circ}$ and must be checked with the vehicle laden.

Hawk Mk. III to VI.—Adjustment is by correct disposition of shims, on either side of the upper-link inner-fulcrum pin, shims being located between the fulcrum pin and crossmember bracket and between fulcrum pin and chassis bracket.

FIG. 4.—SECTION THROUGH UPPER-LINK EYEBOLT SHOWING METHOD OF CAMBER ADJUSTMENT ON SUPER SNIPE MK. IV



If adjustment is required, slacken the nuts of the upper fulcrum-pin bolts. To increase wheel-camber angle remove shims, which are slotted for convenient removal or refitting, from the road wheel side of the upper fulcrum pin and refit them on the other (chassis) side of the fulcrum pin. To decrease camber add shims removed from the chassis-bracket side to the road-wheel side of the fulcrum pin.

Hawk Series I, Ia, II and Super Snipe Series I to III.—Adjustment is simpler on these models, as there is only one set of shims, positioned between fulcrum pin and crossmember bracket. Add or subtract shims from this location with the car jacked up, the road wheel removed and some of the weight taken under the stub-axle carrier.

Super Snipe Mk. IV.—Adjust camber by rotating the eccentric upper-link outer-fulcrum pin after slackening the clamp bolt in the stub-axle carrier. If necessary slacken the nuts of the cotters securing the screwed bushes in the fork of the upper link and turn the bushes to centralise the stub-axle carrier in the fork. Remove grease nipple from pin and use $\frac{1}{4}$ -in. Allen key to turn.

STEERING GEAR

Burman Steering Gear

Burman worm and nut steering boxes are used on Hawk Mk. I and II, Snipe 18 h.p., Super Snipe and Pullman Mk. I models.

To remove unit from car draw off drop arm from taper splines, using an extractor. Disconnect battery, slacken clamp bolt at bottom of steering box and draw out top controls and stator tube, using a tin to catch oil which will run out from bottom gland. Remove steering wheel and front-seat cushion. Disconnect column-tube clamps and chassis-frame bracket. Remove unit forwards and upwards over front wing.

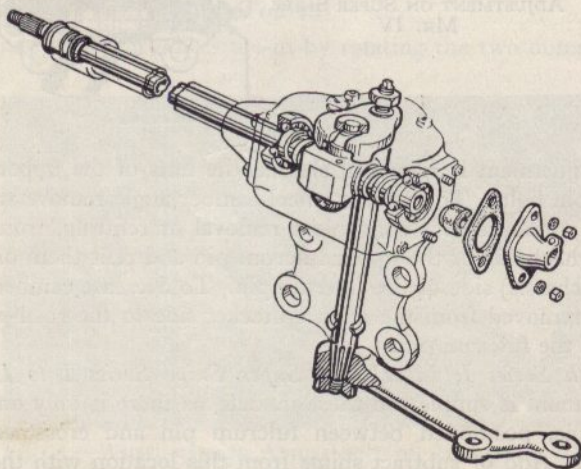


FIG. 5.—BURMAN STEERING-GEAR ASSEMBLY ON HAWK Mk. III TO VI.

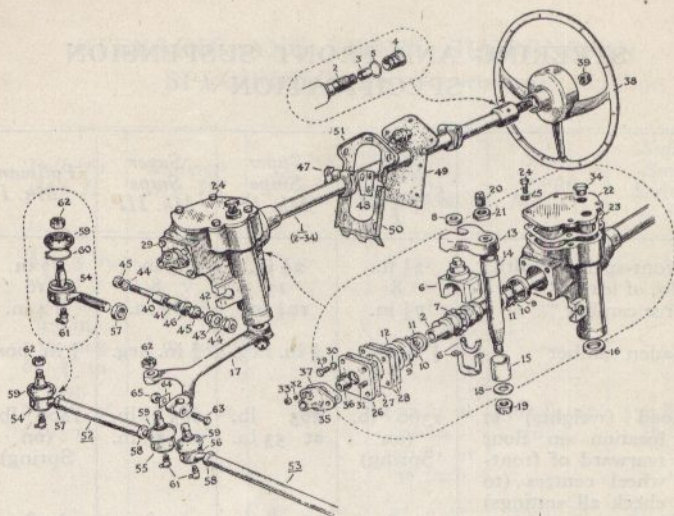


FIG. 6.—EXPLODED VIEW OF BURMAN STEERING UNIT FITTED TO SUPER SNIPE AND PULLMAN MK. II AND III.

- | | |
|------------------------------------|--|
| 1. Steering-column outer tube. | 25. Spring washer. |
| 2. Inner column. | 26. Bottom plate. |
| 3. Stator tube bush. | 27. Paper joint. |
| 4. Inner-column top bush (Tufnol). | 28. Shims. |
| 5. Circlip. | 29. Bottom-plate bolts. |
| 6. Main nut. | 30. Spring washer. |
| 7. Balls. | 31. Stud. |
| 8. Guide roller. | 32. Spring washer. |
| 9. Bearing cups. | 33. Nut. |
| 10. Ball bearings. | 34. Filler plug. |
| 11. Upper-bearing cone. | 35. Stator-tube clamp (gland housing). |
| 12. Distance piece. | 36. Gland packing. |
| 13. Rocker shaft. | 37. Gasket. |
| 14. Bush. | 38. Steering wheel. |
| 15. Bush. | 39. Nut. |
| 16. Oil seal. | 40-46. Adjuster bolt in chassis. |
| 17. Drop arm. | 47-51. Mounting bracket assembly. |
| 18. Washer. | 52. Right-hand track rod cross tube. |
| 19. Drop-arm nut. | 53. Left-hand track rod cross tube. |
| 20. Adjuster screw. | 54-62. Ball joint assemblies. |
| 21. Locknut. | 63-65. Clamp bolt, lockwasher and nut. |
| 22. Side cover. | |
| 23. Paper washer. | |
| 24. Side-cover bolts. | |

STEERING AND FRONT SUSPENSION SPECIFICATION

	<i>Snipe and Super Snipe Mk. I</i>	<i>Super Snipe Mk. II</i>	<i>Super Snipe Mk. III</i>	<i>Pullman Mk. I</i>
Front-spring Width	2½ in.	2½ in.	5 in.	2½ in.
No. of leaves	8	15	8	16
Free camber	7¼ in.	10½ in.	9¾ in.	9.4 in.
Laden camber	½ in. pos.	½ in. neg.	¾ in. neg.	¼ in. pos.
Load (weights) at location on floor rearward of front- wheel centres (to check all settings)	1560 lb. (on Spring)	265 lb. at 53 in.	265 lb. at 53 in.	1800 lb. (on Spring)
Wheel camber	1°	1°	1°	1°
Castor angle	2° 52'	0°	0°	2° 23'
King-pin inclination	10°	10°	10°	10°

Adjust column end float by nut and locknut at upper end of column, concealed by spring dust cover on 6-cylinder models. Adjust rocker-shaft end float by grub screw and locknut on steering-box cover plate.

Take care not to damage gland when refitting stator tube. Top up unit when completed.

Re-circulating Ball-type Steering Gear—Later Models

These units require little attention in service, apart from occasional adjustment of the rocker-shaft end float, the need for which is denoted by a knock or rattle when driving over rough roads or if the wheel is turned a small amount in both directions with the car stationary.

To adjust, remove the lockplate, slacken the grubscrew locknut on the top cover and tighten the grubscrew until the steering is

STEERING AND FRONT SUSPENSION SPECIFICATION—(continued)

<i>Pullman Mk. II</i>	<i>Pullman Mk. III</i>	<i>Hawk Mk. III to VI</i>	<i>Hawk Series I, Ia, II</i>	<i>Super Snipe Mk. IV</i>	<i>Super Snipe Series I to III</i>
2½ or 5 in. 17 or 9 9·8 or 9·6 in. 1 in. neg. or ¾ in. neg. 260 lb. at 49½ in.	5 in. 9 9·6 in. ¾ in. neg. 382 lb. at 49½ in.	— — — — (A)	— — — — 450 lb. at 36 in. 540 lb. at 36 in.†	— — — — 365 lb. at 40 in.	— — — — 370 lb. at 36 in.
1° 0° 10°	1° 0° 10°	¾° ± ¼° 0° 8¼° ± ¼°	¾° ± ¼° ½° pos.* ½° neg.† 8¼° ± ¼°	¾° ± ¼° 1° 5' 5¼°	¾° ± ¼° ½° neg. 8¼° ± ¼°

Front-wheel toe-in (track), all models: ½ in.

(A) Location 35 in. at following load (lb.): Mk. III 374; Mk. IV 299; Mk. V 272; Mk. VI 319; Mk. VI Estate car 393.

* Up to A5706749. † From A5706750. ‡ Later Series II.

felt to bind. Release grubscrew until just free, tighten the lock-nut and refit the lock plate.

Column end-float adjustment is not normally required in service and, as adjustment requires the removal of shims behind the steering-box end cover, this operation must be carried out with the unit removed from the car. Removal of the end cover will release the uncaged balls of the lower worm bearing, which can only be refitted with the unit on the bench.

Steering Linkage

Wear in ball joints or idler-lever pivots must be remedied by renewal of the parts. No adjustment is provided.

CHAPTER XI

ELECTRICAL SYSTEM

A 12-volt, earth-return, electrical system is used on all models, with the positive terminal of the battery connected to earth, i.e. to some part of the metal chassis or body structure, with the positive side of the principal remaining units, as listed below, connected to earth in a similar manner.

The electrical system can be broken down into the following units:

- (1) Battery.
- (2) Dynamo (generator), cut-out, regulator and fuse unit.
- (3) Starter and starter switch.
- (4) Ignition system, comprising coil, distributor, plugs, high- and low-tension leads.
- (5) Lamps, switches, trafficators or flashing indicators, horn, screenwipers, etc.
- (6) Ammeter and/or ignition and dynamo warning light.

Battery Maintenance

Keep the battery and its surroundings clean and dry. Give particular attention to the battery top to prevent electrical leakage between the cell terminals. Check the electrolyte (acid and distilled water mixture, of correct specific gravity) level and top-up when necessary with distilled water only. The correct level is just above the tops of the separators. Do not overfill or acid will escape through the vent holes in the filler caps. The use of a Lucas battery filler will be found helpful when topping up, as it ensures that the correct level is maintained by stopping the flow of distilled water, issuing from the filler nozzle resting on the tops of the plates, when the electrolyte reaches the correct level.

Never use a naked light when examining the battery level, as fumes can be inflammable and explosive.

Dynamo

This is a two-brush machine arranged to work in conjunction with a compensated-voltage-control regulator unit. The output is controlled by the regulator and is dependent on the state of charge of the battery and the loading of the electrical equipment in use. When the battery is in a low state of charge, the generator gives a high output which is reduced by the regulator to an amount which is sufficient to keep the battery in good condition as the state of charge of the battery rises.

Dynamo Maintenance

Lubrication of the commutator end bush is recommended every 6,000 miles. This is achieved on early dynamos by removing the screwed cap, felt pad and spring, packing the cap half full with high-melting-point grease or petroleum jelly and refitting. On later units insert engine oil through the hole in the end of the bushing. Apart from periodic lubrication, the only attention normally required is to adjust the belt by slackening the dynamo fixing bolts and the adjusting-strap bolt and swinging the unit outwards, or occasionally to renew the brushes.

Brushes may stick due to over-lubrication and a little petrol will usually permit the brush to be extracted. Do not tug hard on the lead to the brush, or it may break. Reduce the sides of the brush with a file, if necessary, to ensure that it moves freely in the holder.

On dynamos fitted to all but the latest models, the brush gear is inspected after removal of the metal band at the commutator end of the yoke, or dynamo body. Insert a hooked piece of wire into the loop of the brush-tension spring, lift the spring away from the top of the brush and gently raise the brush. With the brushes out of their holders hold a petrol moistened cloth against the armature and rotate by hand to clean the commutator. If this is ridged or badly worn, expert attention and specialised equipment will be required for repairs.

On the latest dynamos access to the brush gear is by removal of the dynamo from the engine, removing the through bolts and withdrawing the commutator end bracket and yoke, after removal of the field-terminal nut and washer, from the drive-end

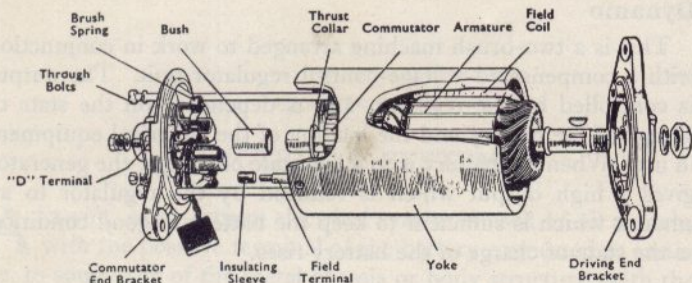


FIG. 1.—EXPLODED VIEW OF LATER-TYPE DYNAMO

bracket and armature. Partly lift both brushes and trap them in the raised position with the tension springs. Loosely assemble the end cover to the armature and release the brushes so that they resume their correct position on the commutator.

When reassembling ensure that the brushes are assembled the right way round and in their correct holders.

Starter Motor

This requires no lubrication and rarely needs attention, apart from occasional replacement of the brushes.

If difficulty is experienced with the starter-drive pinion not meshing correctly with the flywheel, it may be that the drive requires cleaning. The barrel assembly should move freely on the screwed sleeve. Any dirt or other foreign matter should be washed off with paraffin.

In the event of the pinion becoming jammed in mesh with the

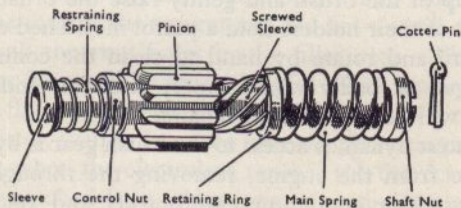


FIG. 2.—STARTER-MOTOR DRIVE

flywheel, it can usually be freed by turning the starter-motor armature by means of a spanner applied to the square-ended extension at the commutator end. This is accessible after removing the cap, which is a push fit.

Distributor

This component, in conjunction with the ignition coil, provides a high-tension spark to each plug, in the correct firing sequence and, by means of mechanical and vacuum-operated linkages,

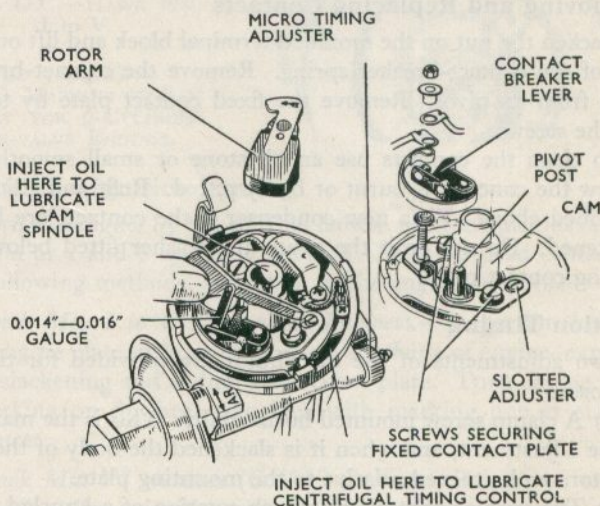


FIG. 3.—DISTRIBUTOR MAINTENANCE

automatically advances or retards the spark to each cylinder, to suit the speed of the engine and the load under which it is operating.

Once the distributor has been set to the correct static ignition-timing position, i.e. with the contact-breaker points commencing to open just before top dead centre on the firing stroke, the varying degrees of automatic advance and retard will be looked after by the mechanism inside the distributor.

Contact-breaker-point Adjustment

Turn the engine by hand until the contacts show the maximum opening. Slacken the two screws securing the fixed contact plate and adjust its position to give the correct gap. This is 0.010–0.012 in. for distributors fitted to early models and 0.014–0.016 in. for later models (for details see table at end of chapter).

A slotted adjuster is used on the latest fixed contact plates and is in the form of a third screw which is rotated to set the gap. Tighten the fixing screws when the gap is corrected.

Removing and Replacing Contacts

Slacken the nut on the moulded terminal block and lift out the end of the contact-breaker spring. Remove the contact-breaker lever from its pivot. Remove the fixed contact plate by taking out the screws.

To clean the contacts use an oil stone or small smooth file. Renew the contacts if burnt or badly pitted. Refit and adjust as described above. Fit a new condenser if the contacts are badly blackened. Do not omit the insulating washer fitted below the moving contact pivot.

Ignition Timing

Two adjustments of the distributor are provided for timing purposes:

(1) A clamp screw mounted horizontally. This is the main, or coarse adjustment, and when it is slackened the body of the distributor can be turned relative to the mounting plate.

(2) The vernier control, by which rotation of a knurled knob turns the distributor a very small amount at a time and forms a fine adjustment for final setting. It also provides an easy means of advancing or retarding the ignition on the road.

The knob should be turned in the direction of the arrow, marked A/R on the distributor body adjacent to the sliding scale, to advance or retard the ignition respectively. One revolution of the knob is equal to approximately three degrees of advance on the crankshaft, and one division of the scale is equal to four crankshaft degrees. The action of the knob itself is graduated and enables this to be moved one "click" at a time.

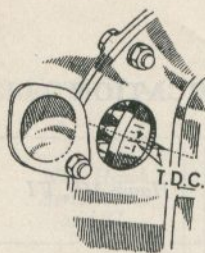


FIG. 4 (above).—
FLYWHEEL TIMING MARKS
FOR T.D.C.—HAWK Mk.
I to V.

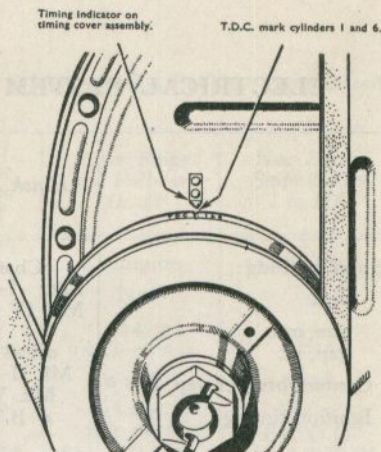


FIG. 5 (right).—
T.D.C. MARKING ON FAN
PULLEY FOR 6-CYLINDER
SIDE-VALVE ENGINES.

Resetting—Ignition Timing

Turn the engine by the starting handle until the pistons of No. 1 and 4 or 1 and 6 cylinders are at T.D.C. (top dead centre) by the following methods, according to the engine concerned:

Hawk Mk. I to V (Side-valve Engines).—Inspection hole in rear engine plate in front of flywheel at offside of engine, exposed after slackening and sliding aside cover plate. Turn engine until $\frac{1}{4}$ marking on flywheel coincides with marking line at side of aperture.

Hawk Mk. VI onwards (O.H.V. Engine).—Pointer on crank-shaft fan pulley coincides with pointer on timing cover.

Snipe and Super Snipe and Pullman Mk. I to III (Side-valve Engine).—Groove on pulley coincides with pointer on timing cover.

Super Snipe and Pullman Mk. IV (O.H.V. Engine).—Unscrew the timing plug from the left-hand side of the engine rear plate (in front of the flywheel), then reverse it so that the plain end passes through the tapped hole from which it was removed. Turn the engine by the handle until the timing plug can be pushed into the locating hole in the front face of the flywheel with No. 1

ELECTRICAL SYSTEM SPECIFICATION

	<i>Hawk Mk. I-V</i>	<i>Hawk Mk. VI</i>
Sparking Plug:	Champion	Champion
type	Mk. I-III L10	N5
size, mm.	Mk. IV and V N5	
gap, in.	¹⁴ 0.028—0.032	¹⁴ 0.028/0.032
Contact-breaker gap, in.	Mk. I-V 0.012	0.014/0.016
Ignition timing	Mk. V 0.016	6° B.T.D.C.
	4° B.T.D.C.	
Battery type	Lucas G.T.W. 9A	Lucas G.T.W. 9A
Battery capacity amp.-hr.	⁵¹	⁵¹
Specific gravity, fully charged at 70° F.	1.285—1.295	1.285—1.295
Generator regulating voltage at 68° F.	15.8—16.4	15.8—16.4
Firing order	1,3,4,2	1,3,4,2

cylinder firing. On later engines pulley and timing cover are equipped with a mark and pointer respectively.

New Super Snipe Series I, II and III.—Pointers on pulley and timing cover coincide.

Distributor

(1) Set the vernier control to the midway position on the scale.

(2) Remove the distributor cap and connect a 12-volt bulb between the low-tension terminal of the distributor and a good earth. With the battery connected and the ignition switched on, this bulb will light when the contact-breaker points open.

(3) Slacken the distributor clamp screw and rotate the body

ELECTRICAL SYSTEM SPECIFICATION—(continued)

<i>New Hawk Series I, Ia and II</i>	<i>Snipe Mk. I, Super Snipe and Pullman Mk. I-III</i>	<i>Super Snipe and Pullman Mk. IV</i>	<i>New Super Snipe Series I to III</i>
Champion	Champion	Champion	Champion
N5	L10	N5	N5
14	14	14	14
0.025	0.028—0.032	0.028—0.032	0.025
0.016	0.012	0.016	0.016
T.D.C. to 2°	6° B.T.D.C.	5°—7°	5°—7°
A.T.D.C.		B.T.D.C.	B.T.D.C.
Lucas G.T.W.	Lucas G.T.W.	Lucas G.T.W.	Lucas G.T.W.
9A or G.T. 9A	11A	11A	9A or G.T. 9A
51	64	64	51
1.285—1.295	1.285—1.295	1.285—1.295	1.285—1.295
15.6—16.2	15.8—16.4	15.8—16.4	14.9—15.5
1,3,4,2	1,5,3,6,2,4	1,5,3,6,2,4	1,5,3,6,2,4

of the distributor in the direction of actual rotation about a quarter turn. Disconnect the vacuum-advance tubing if necessary.

(4) Switch on the ignition and return the distributor body towards its original position (against actual rotation) until the bulb just lights with No. 1 cylinder firing. Tighten the clamp screw.

The ignition timing is now set at T.D.C. and the distributor can be adjusted by means of the vernier to provide the setting in degrees before or after T.D.C. One vernier division equals four crankshaft degrees. One revolution of the knob equals three degrees.

The timing for all models is given in the electrical specification.

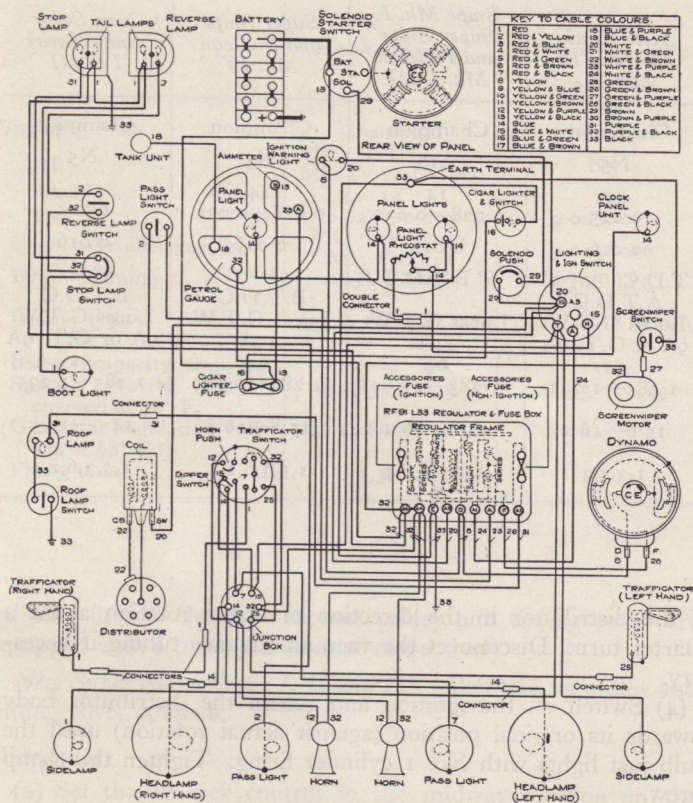
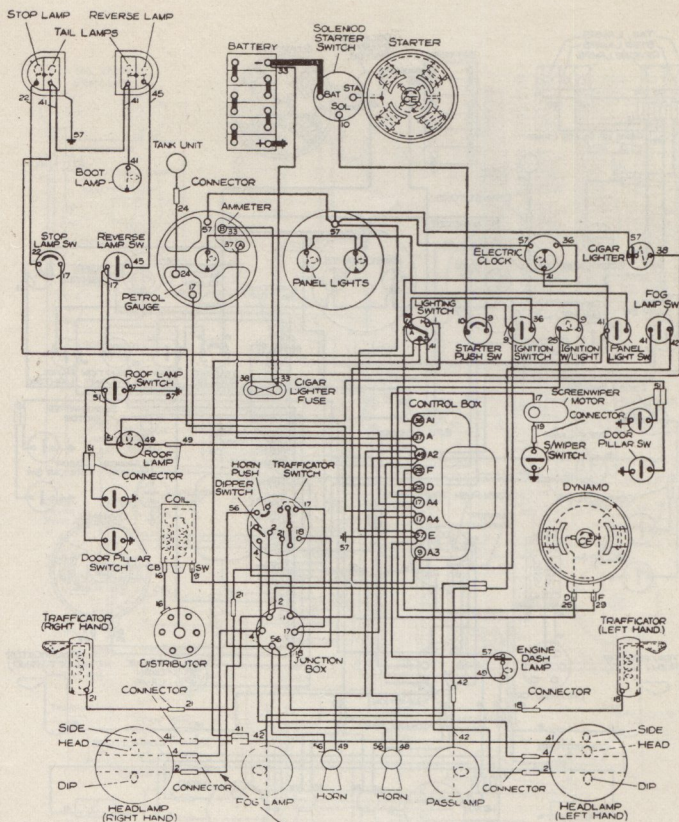


FIG. 6.—WIRING DIAGRAM FOR SNIPE AND SUPER SNIPE Mk. I.



This lead is not required where
single filament bulb is fitted.

FIG. 7.—WIRING DIAGRAM FOR SUPER SNIPE MK. II.

The key to cable colours is as given for Fig. 9. *Note.*—After chassis No. P.980392 separate side lamps are fitted and the fog lamps and fog-lamp switch are deleted.

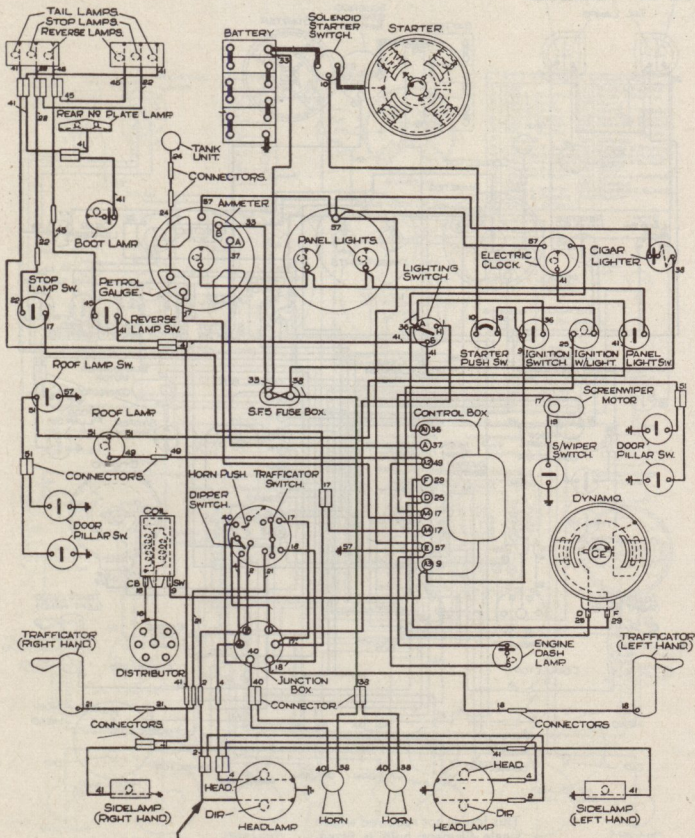


FIG. 8.—WIRING DIAGRAM FOR SUPER SNIPE Mk. III.

The key to cable colours is as given for Fig. 9.

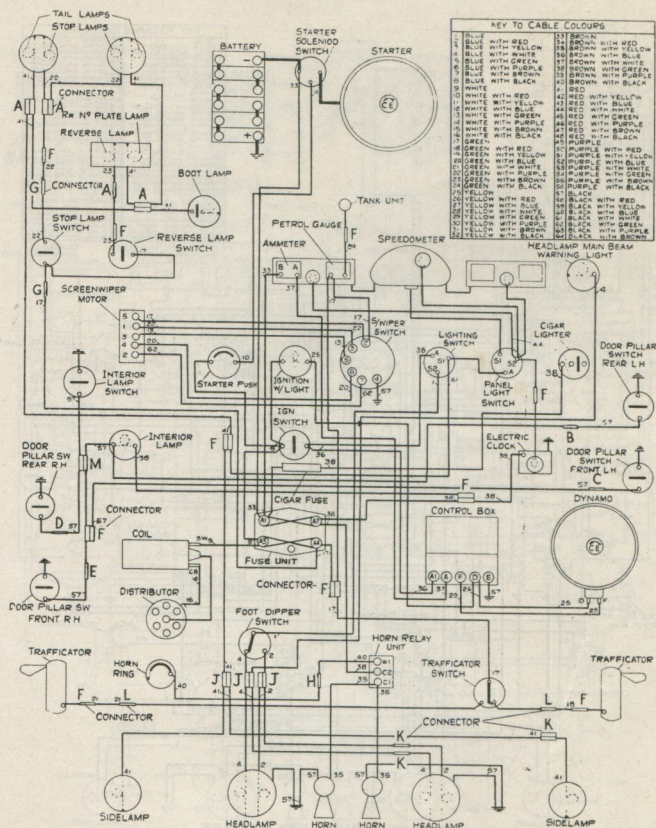


FIG. 9.—WIRING DIAGRAM FOR SUPER SNIPE MK. IV.

Vehicles fitted with semaphore-type direction indicators.

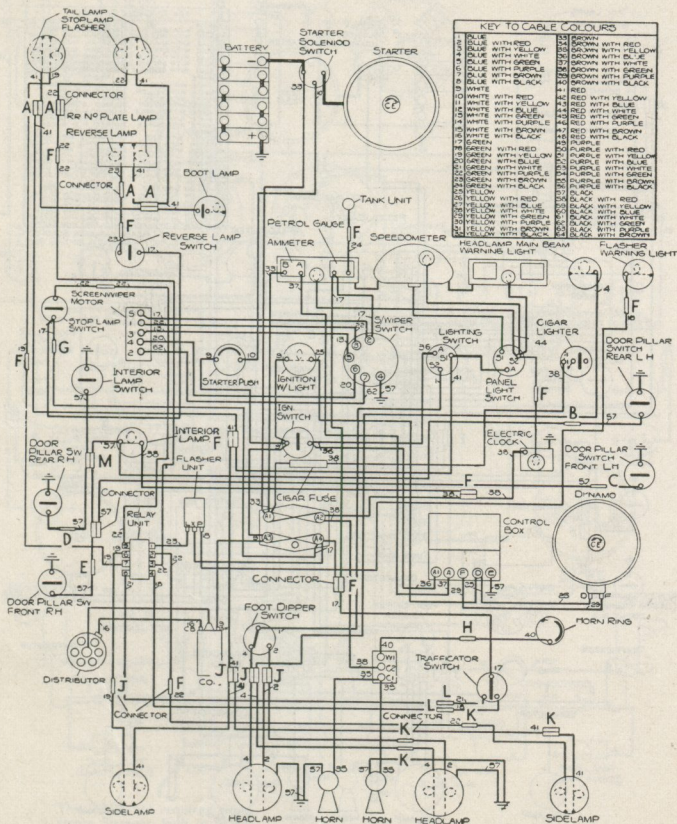


FIG. 10.—WIRING DIAGRAM FOR SUPER SNIPE MK. IV.

Vehicles fitted with flashing direction indicators.

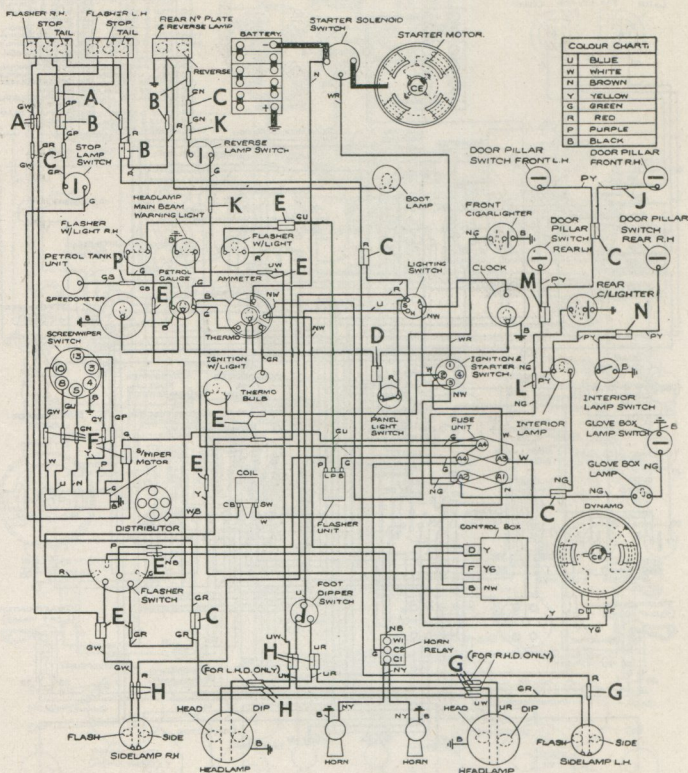
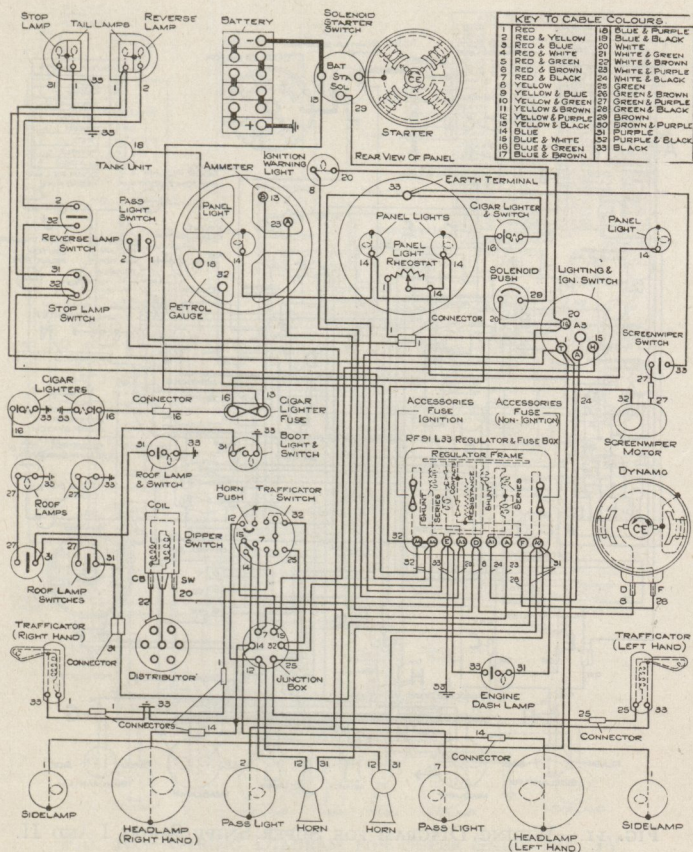


FIG. 11.—WIRING DIAGRAM FOR SUPER SNIPE SERIES I AND II.



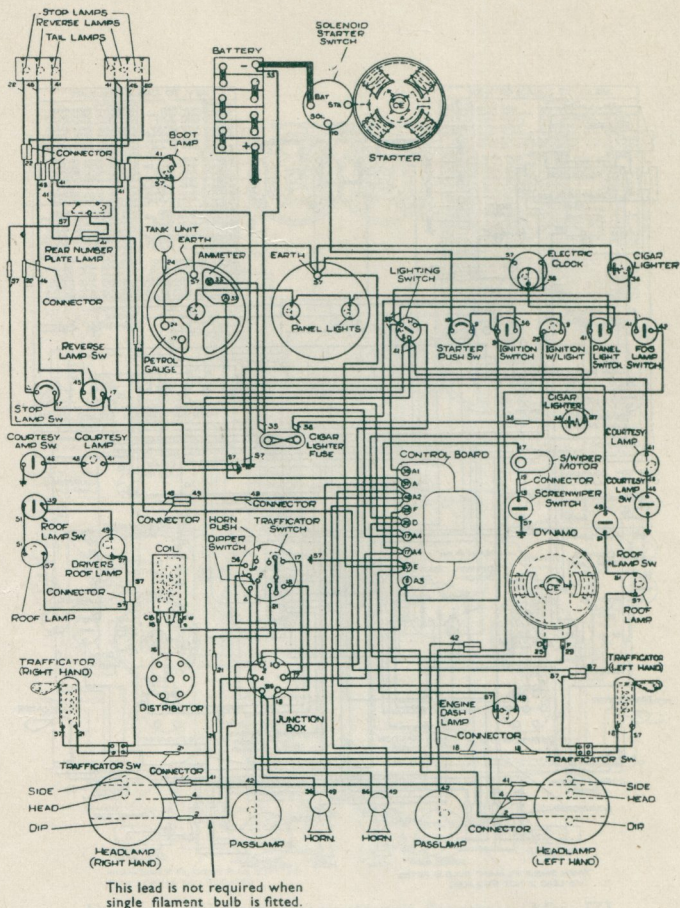


FIG. 13.—WIRING DIAGRAM FOR PULLMAN MK. II.

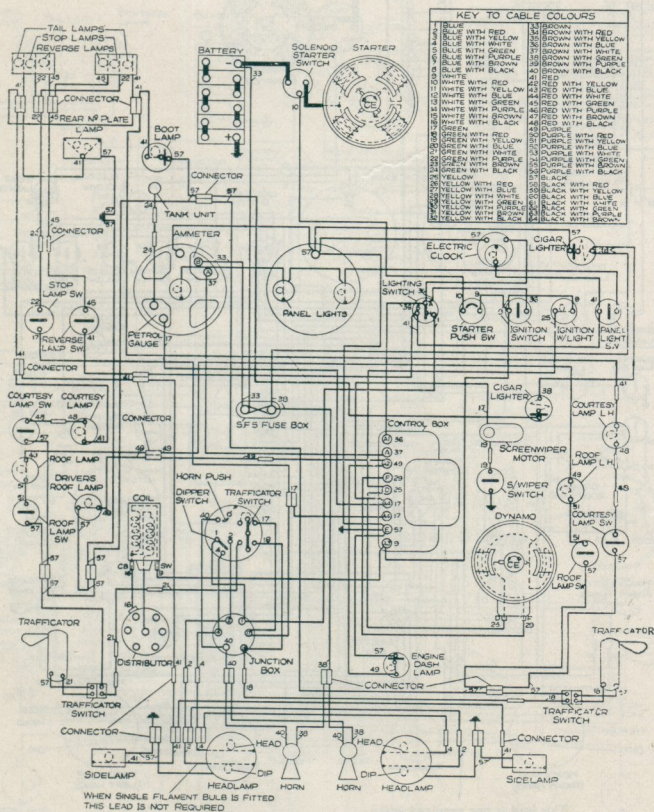


FIG. 14.—WIRING DIAGRAM FOR PULLMAN Mk. III.

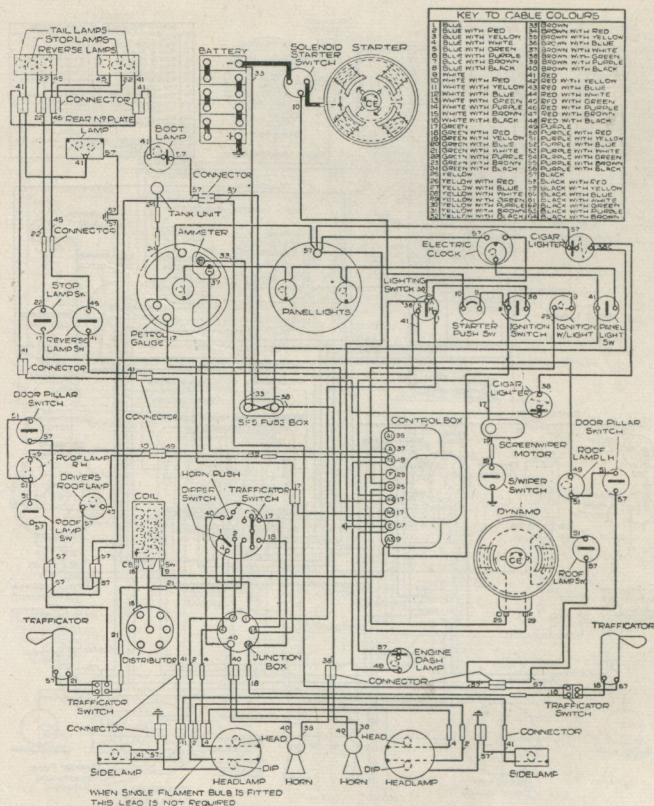


FIG. 15.—WIRING DIAGRAM FOR IMPERIAL Mk. III.

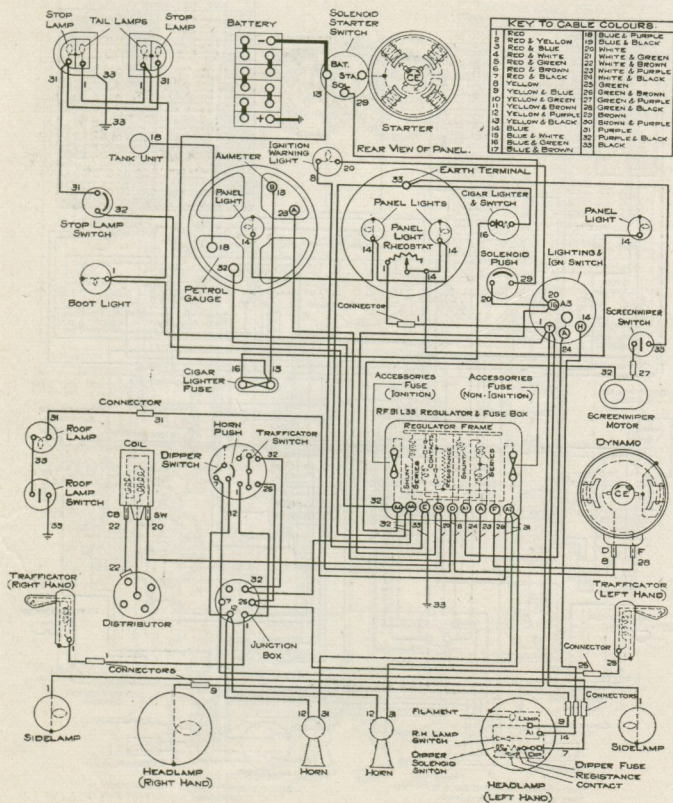


FIG. 16.—WIRING DIAGRAM FOR HAWK MK. II.

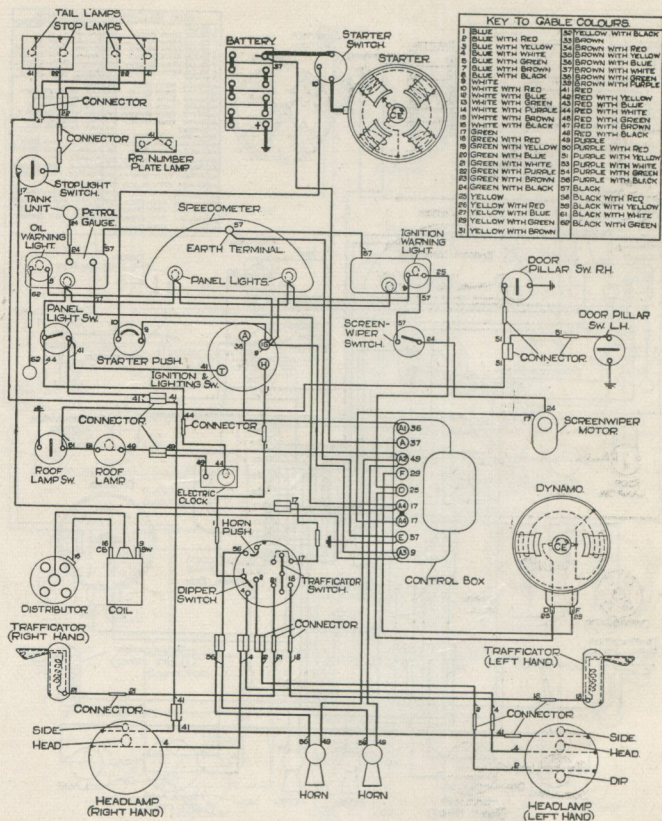


FIG. 17.—WIRING DIAGRAM FOR HAWK MK. III.

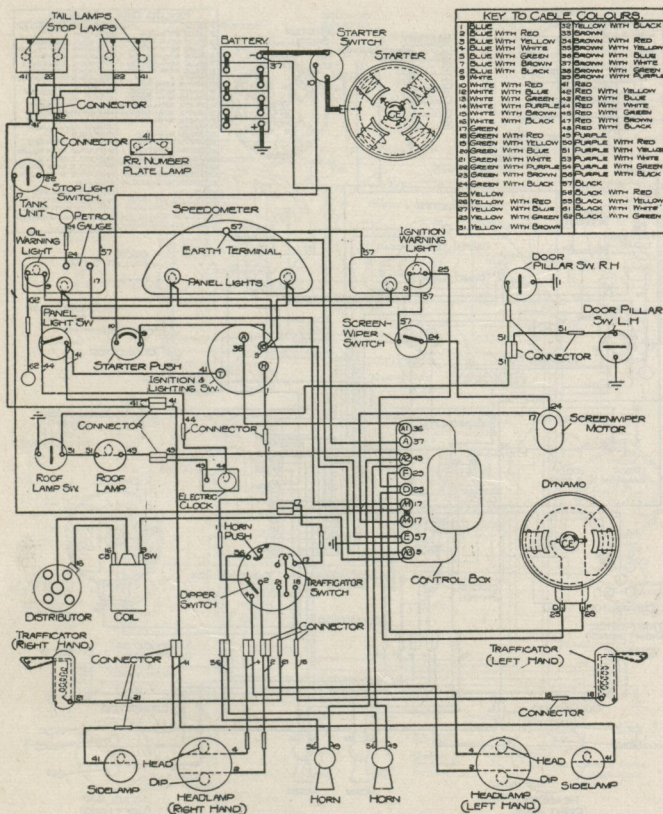


FIG. 18.—WIRING DIAGRAM FOR HAWK Mk. IV.

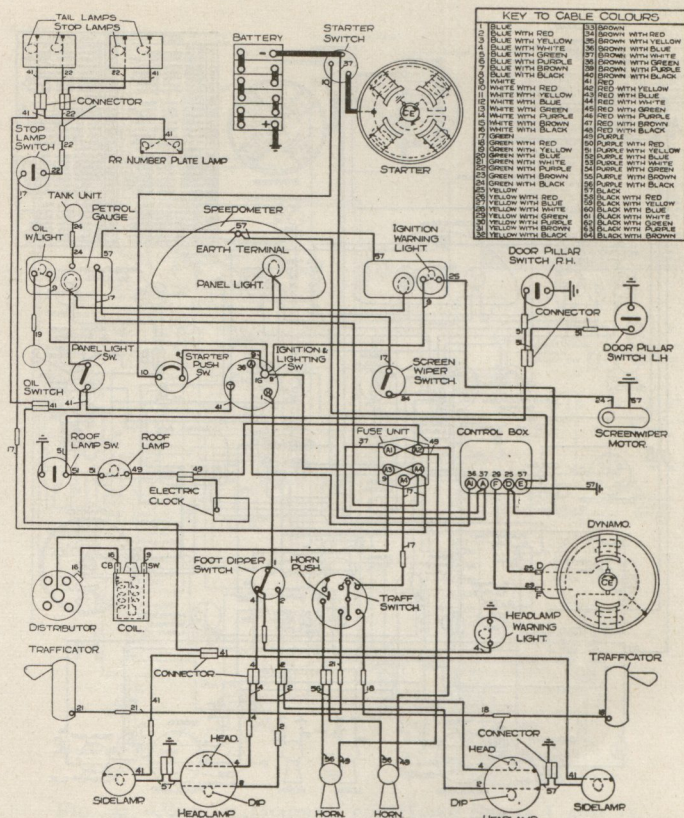


FIG. 19.—WIRING DIAGRAM FOR HAWK MK. V.

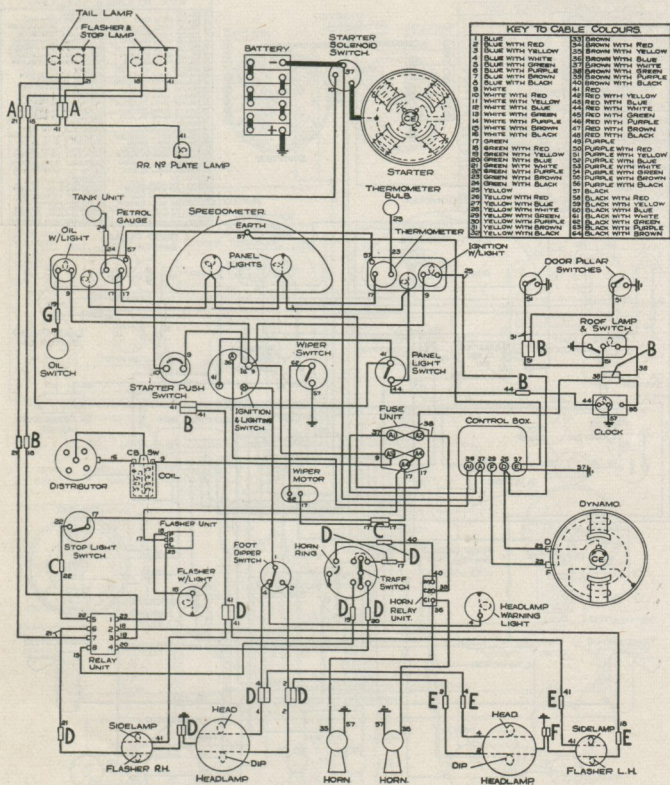


FIG. 20.—WIRING DIAGRAM FOR HAWK Mk. VI.

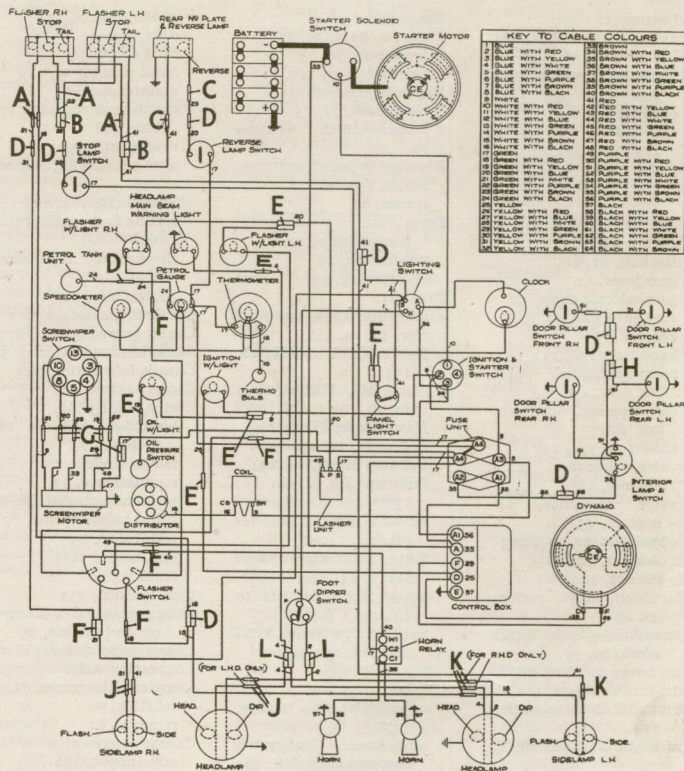


FIG. 21.—WIRING DIAGRAM FOR HAWK SERIES I AND IA.

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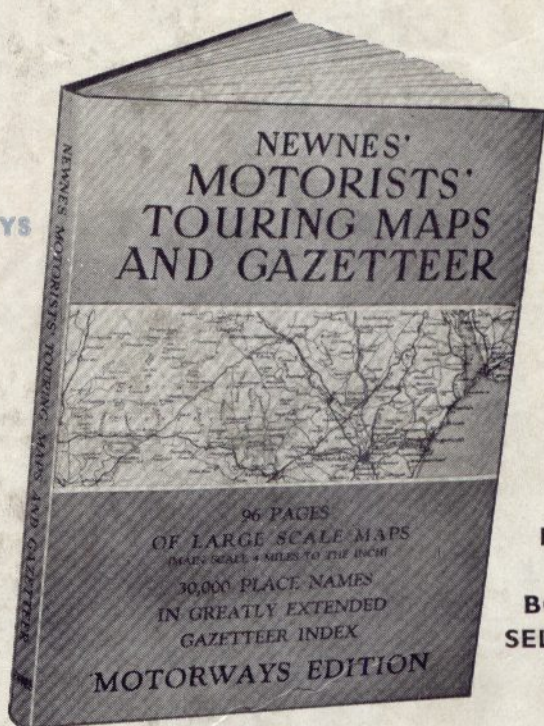
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